PERSPECTIVES ON CLIMATE CHANGE

HEARING

BEFORE THE

SUBCOMMITTEE ON ENERGY AND AIR QUALITY

OF THE

COMMITTEE ON ENERGY AND COMMERCE

AND THE

SUBCOMMITTEE ON ENERGY AND THE ENVIRONMENT

OF THE

COMMITTEE ON SCIENCE AND TECHNOLOGY

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PERSPECTIVES ON CLIMATE CHANGE

WEDNESDAY, MARCH 21, 2007

HOUSE OF REPRESENTATIVES, SUBCOMMITTEE ON ENERGY AND AIR QUALITY, COMMITTEE ON ENERGY AND COMMERCE; JOINT WITH THE SUBCOMMITTEE ON ENERGY AND ENVIRONMENT, COMMITTEE ON SCIENCE AND TECHNOLOGY,
Washington, DC.

The subcommittees met, pursuant to call, at 9:48 a.m., in room 2123, Rayburn House Office Building, Hon. John Dingell (chairman of the Committee on Energy and Commerce) presiding.

Present from the Committee on Energy and Commerce: Representatives Boucher (chairman, Subcommittee on Energy and Air Quality); Butterfield, Melancon, Barrow, Waxman, Markey, Wynn, Doyle, Harman, Allen, Gonzalez, Inslee, Baldwin, Ross, Hooley, Weiner, Matheson, Barton, Hastert, Upton, Whitfield, Shimkus, Shadegg, Pickering, Buyer, Bono, Walden, Rogers, Myrick, Sullivan, and Burgess.

Present from the Committee on Science and Technology: Representatives Gordon (chairman, Committee on Science and Technology) Lampson (chairman, Subcommittee on Energy and Environment); Costello, Woolsey, Lipinski, Giffords, McNerney, Udall, Baird, Hall, Inglis, Bartlett, Biggert, Akin, Neugebauer, and McCaul.

Staff present from the Committee on Energy and Commerce: Dennis B. Fitzgibbons, Gregg A. Rothschild, Sharon E. Davis, Jonathan Cordone, Sue Sheridan, Lorie Schmidt, Bruce Harris, Chris Treanor, David McCarthy, Kurt Bilas, Tom Hassenboehler, Matt Johnson, and Peter Kielty.

Staff present from the Committee on Science and Technology: Chuck Atkins, John Piazza, John Fruci, Louis Finkel, Deborah Samantar, Leslee Gilbert, Margaret Caravelli, Amy Carroll, and Elizabeth Stack.

OPENING STATEMENT OF HON. JOHN D. DINGELL, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF MICHIGAN

Chairman DINGELL. The committee will come to order.

The Committee on Energy and Commerce and our distinguished friends from the Committee on Science and Technology are having a joint hearing today amongst the two subcommittees which have the responsibility of addressing the problem of climate change and energy security.

The joint hearing held by the Subcommittee on Energy and Air Quality and the Subcommittee on Energy and Environment of the

Committee on Science and Technology has been scheduled for a goodly while. I want to welcome my colleagues from both of the committees, especially our colleagues from across the hall, in particular Chairman Gordon and Subcommittee Chairman Lampson.

By agreement amongst the majority and the minority of both committees, the hearing will be conducted under the Rules of the Committee on Energy and Commerce. As such, Members who were here when the committee was called to order will be recognized in the order of seniority alternating between the two subcommittees, and other Members will then be recognized in the order in which they have arrived.

Members of both full committees who do not serve on the relevant subcommittees will not be able to participate in today's hearing. Many of them are seated in the front row of the audience, and I want to thank them for their efforts and their interest in these important subjects. Under the rules of the committee, all written statements of the Members will be inserted into the record, and all Members may ask additional questions of the witnesses in writing through the chairman of the Committee on Energy and Commerce.

These questions will be included in the official hearing record along with the response of the witness.

I am sure all will know that the committees will seek to see to it that this matter is handled to the full satisfaction of all.

All will be notified in subsequent days of the proper procedures for submitting statements and questions. By agreements with our good friends and colleagues in the minority, only the chairmen and ranking members of the full committees and relevant subcommittees will be recognized for opening statements.

Other Members will be permitted to make their opening statements which will be inserted in the record in proper fashion.

Our first witness has been dedicated to the issues of energy security and global warming throughout his career. We are delighted to welcome him back to this room where he served with such distinction for so long.

His resume includes many impressive titles, including Academy Award winner, most notably, and former member of the Committee on Energy and Commerce, which is I think perhaps the most important of his accomplishments. And incidentally he also served as Vice President of the United States, as we will all recall, for 8 years and was the Democratic nominee for the President of the United States.

To allow the Vice President to interact with our members as much as possible, the Chair will forgo his opening statement.

With that, it is now my privilege to recognize the ranking member of the full Committee on Energy and Commerce, the distinguished gentleman from Texas, our colleague, Mr. Barton, for 5 minutes.

Mr. BARTON. Mr. Chairman, before I do that, I have a parliamentary inquiry.

Chairman DINGELL. The gentleman will state the parliamentary inquiry.

Mr. BARTON. Mr. Chairman, as you may recall, when we adopted the rules for this committee in the organizational meeting, you and I entered into a colloquy which became a part of the rules package

that stated at hearings like this members of the committee that are not a member of the subcommittee and members of other committees that wish to attend would be welcome to sit in.

I noticed that we have at least three members of the Energy and Commerce Committee or the Science Committee in the audience, and there may, I see several other Members I am not sure if they are members of the Science Committee.

I would like to know why it is that they are not allowed to sit up on the dais. I respect the right that they may not be able to ask questions, because this is a joint hearing, but I do not understand why we are violating the rules that we just adopted and they can't even sit at the dais with the other members of the committee that they are a member of.

Chairman DINGELL. The Chair would advise my good friend and colleague that that is a matter within the discretion of the Chair. I have this matter under very careful consideration and there is a fair probability that some subsequent action will be taken by the Chair on this matter. I would note that we have here a gathering of Members which is at least as large as either of the two committees. And there are problems with availability of seating. The Chair will work the with the gentleman to try to resolve these questions in a fashion——

Mr. BARTON. Further parliamentary inquiry.

Chairman DINGELL. The gentleman continues to be recognized.

Mr. BARTON. My understanding is that, once we adopted, after the colloquy, the rules package, that it is not the prerogative of the Chair, that if the Chair wishes to waive that rule, he has to ask unanimous consent.

Mr. STUPAK. With all respect, the Chair is going to inform my good friend that it is a prerogative of the Chair and the present occupant of the Chair deems it to be a prerogative of the Chair and will act accordingly.

Now having said these things, the Chair is going to remind my good friend, we have a lot of Members who are sitting here who wish to be recognized and be heard. I don't want to deny my good friend the right to be heard on any points of concern.

I do want to remind him, however, though, that the time that he and I are taking for these purposes are probably denying the Members the opportunity to be heard at a later time to ask questions.

Mr. BARTON. Well, I have two more parliamentary inquiries.

Chairman DINGELL. The gentleman is recognized.

Mr. BARTON. On this last parliamentary, I am not going to press the point and ask for a actual parliamentary ruling and appeal the ruling of the Chair because I support the fact that we are holding this hearing. But I will ask the chairman if he is going to use his good offices to try to find seats for the members of the full committee at the dais.

Chairman DINGELL. The Chair will inform the gentleman the Chair is thinking very actively on this matter and will probably advise the gentleman shortly of any further decisions made.

Mr. BARTON. Further parliamentary inquiry.

Chairman DINGELL. The gentleman continues to be recognized.

Mr. BARTON. We have another rule. And I believe this is a rule also of the Science Committee, and I think it is a rule of every com-

mittee, that witnesses that voluntarily agree to testify are required to have their testimony in writing 48 hours in advance. Now, Mr. Gore is not only a former Vice President, he is a former Member of the House, a former member of this committee, and I believe a former subcommittee chairman of this committee.

We, on the minority received, his written testimony at about 7 o'clock this morning. It apparently got to the majority offices about 1 o'clock this morning.

How are we supposed to prepare questions for our esteemed witness when we are basically given testimony 2 hours before he shows up? And that is a clear violation of the rules.

Chairman DINGELL. Well, if the gentleman would permit, the Chair will respond.

First of all, it is not a violation because this is a matter which is addressed again in the discretion of the Chair. And the Chair has made the decision that we would not enforce this rule according to its absolute terms in view of the power of the Chair to act in his discretion on this particular matter.

The Chair will note that I have observed the gentleman from Texas and my colleagues on the Republican side, and have observed them to be members of great talent and ability.

I have watched them ask questions for many years. I have never found them to be tongue tied or lacking in the ability to address these questions. The statements are available. I am sure the gentleman knows how to ask questions. And I have great confidence in him and the fact that he will ask good questions.

I also would note that we have a very fine copy of the Vice President's book, "An Inconvenient Truth". If the gentleman wishes to have a little reading that he may enjoy during the matter or at later times, I would be happy to make my copy available to him.

Mr. BARTON. Further parliamentary inquiry.

Mr. WAXMAN. Point of order, Mr. Chairman.

Mr. BARTON. I can do it in regular order. If you want to spend 2 hours and have an absolute cat fight, we will do it that way.

Chairman DINGELL. The Chair wants to accommodate my good friend from Texas, and I am going to do my level best to see to it that it is done. And the gentleman will continue to state his parliamentary inquiry, and the Chair will try to respond.

Mr. BARTON. Well, nowhere in the rules, as the minority reads them is it prerogative of the Chair to waive written testimony. That requires unanimous consent. Now, again, because of my affection for the esteemed chairman, I am not going to press that point today because of the importance of this hearing. But this is the last day that we are going to just let regular order be overridden.

Chairman DINGELL. Well, the Chair, again, with all respect and great affection observes to the gentleman, my good friend from Texas, that under rule 4(b)(1) of the rules of this committee, there appears the language requirements for testimony. I quote, "The chairman of the committee may waive the requirements of this paragraph or any part thereof."

Under that provision, the Chair has waived the requirement with regard to the production of books, papers and records and testimony on this particular time. At this particular time and we will try to see to it that that is complied with to whenever the cir-

cumstances permit. And I do want to accommodate my good friend and have a harmonious consideration of the difficult questions before us.

Mr. BARTON. I have one more parliamentary inquiry, and this will honestly be the last one.

Under the rules of the committee, individuals who waive their right to opening statements are given that time in the question period. That is at the discretion of the chairman. What is your ruling going to be on waiving opening statements if we get additional time in the question period?

Chairman DINGELL. The Chair is going to respond this way.

This is a rule. It will be applied on the insistence of any Member. The Chair reminds my good friend that we are in the position of a fairly limited amount of time. We are going to see it to that we try to see to it that the younger members get a full opportunity to be heard. And for the more senior members to take advantage of this is simply to deny the younger members the opportunity to ask questions or to have an adequate amount of time for questions. So the Chair will respect this. But I want to inform my good friend that I think it would be unwise and perhaps unfair for us to do this at this particular time.

So, does the gentleman seek recognition for any further purposes?

Mr. BARTON. No, sir.

Chairman DINGELL. Well, with respect and affection, then the Chair thanks my good friend.

The Chair recognizes now the distinguished gentleman from Texas, Mr. Barton, for such opening statements he chooses to give for 5 minutes.

Mr. BARTON. Mr. Chairman, I am going to waive the opening statement with the understanding that I will have that time in my question period which has been the practice of this committee.

Chairman DINGELL. The gentleman asserts that right, and it will be respected.

The Chair recognizes now my dear friend, the gentleman from Tennessee, who is the chairman of the Science and Technology Committee, for the purpose of introducing our guest. I would note that the gentleman from Tennessee, is also the distinguished representative of the district of which, in which our former colleague and good friend, the Vice President, lives. The gentleman is recognized for 5 minutes.

Chairman GORDON. Thank you, Chairman Dingell, I waive my opening statements so that Members will have more time to question later.

Chairman DINGELL. The Chair thanks the gentleman.

The Chair now recognizes the ranking member of the full Committee on Science and Technology, who is also a member of the Committee on Energy and Commerce, our good friend, Mr. Hall of Texas, for 5 minutes.

Mr. HALL. Ladies and gentlemen of the committee, the two committees, I thank you and thank you for holding this hearing. And I hope that we all benefit from it.

Today we are witnessing an all out assault on all forms of fossil fuels and all forms of nuclear energy. We have to be energy con-

scious and sensible enough to know that fossil fuels will continue to be the major source of energy in the near future. If we allow this attack on energy to go unanswered and have it result in lessening our domestic reliance on fossil fuels, we will force the reliance on the OPEC from the dangers of 60 percent presently to a recklessly dangerous and likely 80 percent of our total energy supply.

Forcing a continued reliance on OPEC will make our energy markets more unstable and dismantle jobs for workers, such as drillers, tool pushers, rough necks and others who furnish the manpower and the woman power necessary to continue the search and the capture of various sources of energy. It would also establish OPEC countries as even more dominant than they are today. Abandoning America's energy producers would result in the death of an energy industry, an industry that helped win world wars and continues to fuel our energy interest today. It could also result in the loss of a generation of young American men and women who would have to fight for energy when and if the OPEC nations abandon the U.S.A. by canceling all sales and casting their future with other than Americans.

We must press for energy self-reliance and continue to pursue technology to combat the threat of increased carbon dioxide. These two goals are interconnected. If we tap into American ingenuity, we not only unleash the power of our Nation's competitiveness, but we also find domestic solutions for our future that are affordable, that are reliable and that are clean.

Republicans in Congress have taken this pro-growth approach over the past several years. The Energy Policy Act of 2005 for instance, included numerous initiatives for greater energy efficiency and alternative energy research and development. In the coming weeks, I plan on introducing legislation that expands on many of these initiatives so that we can continue to develop innovative solutions to our domestic energy needs.

I understand that Dr. Lomborg will be discussing the role of energy research and development and how this approach will cost a lot less than the Kyoto-like policies and yet could potentially have a much greater impact on our climate. These are the types of solutions our country needs, solutions that create jobs, foster American innovation and allow our country to become more energy independent.

The legislation the present congressional leadership is advocating brings about Kyoto-like policies that will cost our Nation a lot of money and won't stop global warming in the future. Moreover, it is clear that other countries who are major polluters are not willing to help offset the giant costs entailed in this type of legislation.

You can bring in testimony of expert after expert, all of whom can say that global warming is a threat to world health, but not one of them will discuss the cost of their recommendations and the lack of the benefit gained at that cost. Yes, the Americans—and the cost to all Americans—must be a part of this discussion.

Finally, the American people will not guess today at what mother nature will do 100 or 1,000 years from now and will not be cajoled, frightened, bullied or sullied into nor lead into a dangerous world that envisions us without a reliable energy supply.

It is not going to happen because it can't happen. Working Americans will not tolerate shipping our jobs to China, one of the world's worst polluters. We should not abandon our obligation to all Americans by allowing the renewed attack on energy by a handful of pro-Kyoto self-styled experts who never mention the cost to be paid by us, the American people—when China, Russia, Mexico, India and others offer more and more pollution and not one penny for the cleanup.

I have used the word "cost" eight times in this speech alone. I have never heard the word used by the Kyoto-ites of this Congress. This Congress will listen to Americans who realize that someone has to pay the cost. I yield back my time.

Chairman DINGELL. The time of the gentleman has expired.

The Chair recognizes now the distinguished chairman of the Subcommittee on Energy and Air Quality of the Committee on Energy and Commerce who has been performing extraordinarily well in addressing in a very aggressive and responsible fashion the subcommittee's review of these important matters. The Chair recognizes the distinguished gentleman from Virginia, Mr. Boucher.

Mr. BOUCHER. Thank you very much, Mr. Chairman. I appreciate your comments. I, too, will waive an opening statement and reserve my time for propounding questions.

Chairman DINGELL. Chair recognizes now the distinguished ranking member of the Subcommittee on Energy and Air Quality, the Committee on Energy and Commerce, our good friend and colleague, the former Speaker of the House, Mr. Hastert of Illinois, for 5 minutes.

Mr. HASTERT. Mr. Chairman, I just want to say, thank you for holding this hearing. I will waive my opening statement and reserve my time as an option in questions. Thank you.

Chairman DINGELL. Statement of the gentleman is waived.

The Chair recognizes now the chairman of the Subcommittee on Energy and Environment of the Committee on Science and Technology, our good friend, Mr. Lampson of Texas, for 5 minutes.

Mr. LAMPSON. Thank you, Mr. Chairman. I, too, will waive my comments and thank you for holding this hearing and, out of respect for both our witnesses and other members of our committee, waive the statements at this time, thank you.

Chairman DINGELL. Chair thanks the gentleman. The Chair now recognizes the distinguished ranking member of the Subcommittee on Energy and Environment of the Committee on Science and Technology, Mr. Inglis of South Carolina.

Mr. Inglis.

Mr. INGLIS. Mr. Chairman, I, too, waive my time and reserve it for questions.

Chairman DINGELL. Gentleman has waived.

The Chair now recognizes our distinguished friend, our good friend from Tennessee, Mr. Gordon, for the chairman of the Committee on Science and Technology for the privilege of introducing Representative Gore, who happens to be a constituent of his.

The distinguished gentleman is recognized.

OPENING STATEMENT OF HON. BART GORDON, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF TENNESSEE

Chairman GORDON. Thank you, Mr. Dingell, in 1984, a young Congressman from Tennessee, named Al Gore, Jr., with a lot of help from his wife, Tipper, was elected to the United States Senate. I was fortunate enough to succeed him in the Sixth Congressional District. And for those first few weeks when I went around in the congressional district, Al was really a legend. He was known for constituency work. He was known for the work he did here legislatively as well as for his oversight.

And so everywhere I would go, people would say you have got some big shoes to fill following Al Gore. Mighty big shoes. And they were correct. But I finally got tired of hearing about it. And I said, they ought not talk about Al's feet that way.

And even though Al represented the entire State, we still shared mutual constituents within the Sixth District, and one of those constituents was a lady named Barbara Mandrell, and it was about that time that she had a song out entitled, "I was country when country wasn't cool." Certainly Albert Gore has had a long passion and dedication to make the world understand that global warming was real and that it had consequences.

We all know that recently the IPCC report stated that with 100 percent certainty, there is global warming. This was unanimously adopted by 113 nations, including the United States and by President Bush. But over 25 years ago, Congressman Albert Gore, Jr., had some of the first hearings on the climate change as chairman of a subcommittee on the Science and Technology Committee. So many hearings later, both in the Congress and the Senate, a few books, an Oscar winning documentary, countless frequent flier miles and literally hundreds of small group slide show presentations later, the world finally is paying attention.

And so, Mr. Vice President, I want to thank you for your passion and dedication. I want to welcome you to this unprecedented joint hearing, the Science and Technology Committee and the Energy and Commerce Committee. And seeing Tipper Gore here, I have to say one last thing, and that is that, my little red-headed daughter Peyton's birthday is today. And we are going to have a little party for her tonight. And I doubt that she is going to ask me what I did today to avert global warming, but I am sure that in the years ahead she is going to ask me, was I a part of the problem, or was I a part of the solution? And thanks to your leadership, I am going to be a part of the solution.

Thank you for being here, and I yield such time as you may consume.

Mr. GORE. Well, thank you very much, Mr. Chairman.

Chairman DINGELL. Other than to say welcome back, welcome home. You served for a long time on this committee and in this room. And I am sure that you feel comfortable and welcome, and that is the way we want you to feel. Welcome back.

STATEMENT OF HON. AL GORE, JR.

Mr. GORE. Thank you so much, Mr. Chairman. It is an emotional occasion for me to come back to this hearing room.

I learned a lot from you, Chairman Dingell, when I first came here in the fall of 1976 and then became a member of this committee and was sworn-in in January 1977.

And, Chairman Gordon, thank you for your friendship all these years and for your leadership on this issue and so many others and thank you for calling me on the telephone in Tennessee the day after the election last November, when it became clear that you were going to be chairing the Science and Technology Committee and you were the first to say, "I want you to come and talk about this issue, and we want to work on it." Chairman Dingell, thank you for calling me and inviting me to come and testify as well.

And to the ranking members, thank you, Congressman Barton, Congressman Hall, we were close friends before you went over to what we jokingly refer to as "the dark side".

And we are friends still. And I want to acknowledge my friends on both sides.

Mr. BARTON. He is threatening to come back over to your side.

Mr. GORE. He would be more than welcome. He would be more than welcome. Always. East Texas and Tennessee have a lot in common.

And Chairman Boucher, thank you. We worked just across the State line for so many years. And I have many friends on both of the committees that are represented here. And I am very grateful for the opportunity to testify before two committees that I did in fact have the privilege of serving on.

Congressman Dingell, I want to say a special word of thanks to you, because our fathers served together. This is the second generation of friendship. And I was reflecting yesterday and doing, just taking a pencil and paper, and at the time when your father and my father served together in the House of Representatives, the concentrations of CO^2 in the atmosphere up here on Capitol Hill and all over the world were just about 300 parts per million. And they really had never gone above 300 parts per million, at least as far back as a million years in the ice record.

And yet, here we are today, and it is already 383 parts per million, just in that short span of time. And that ultimately is what brings me here.

There is a sense of hope in this country that this United States Congress will rise to the occasion and present meaningful solutions to this crisis.

This is the greatest country on the face of this Earth. And the hopes for freedom and the viability and efficacy of self-government rests with the legislative branch of our government in this day and time.

There have been times in the past when our Nation has been called upon to rise above partisanship, above political calculations, above the pressures that have always been present for two and a quarter centuries from special interests of this, that or the other kind, and reach across the aisle and do what history is calling upon all of us as Americans to do.

America is the natural leader of the world. And our world faces a true planetary emergency. I know the phrase sounds shrill. And I know it is a challenge to the moral imagination to see and feel

and understand that the entire relationship between humanity and our planet has been radically altered.

We quadrupled human population in less than one century from 1.6 billion in 1900 to 6.56 billion today. Population is stabilizing of its own accord as girls are educated and women are empowered and family planning that is culturally acceptable in country after country becomes widely available and, most importantly, as child survival rates increase and infant mortality decreases. When those things happen and especially when literacy among women increases around the world, the birth rates come down. The death rates come down, and then the birth rates come down. And it is stabilizing.

But having multiplied by four the number of people on this planet—and we are going from over 6.5 now to over 9.1 almost certainly within the next 40, 45 years—that in itself causes a big change in the relationship between humanity and the planet.

Second, our technologies are thousands of times more powerful than any our grandparents had at their disposal. And so we are even more skillful and more effective in doing the things we have always done, exploiting the Earth for sustenance and providing for our families and going about productive lives. The side effects of what we are doing sometimes now outstrip the development of extra wisdom to make sure that we handle these new powers in a way that doesn't do unintended harm. And somehow we have also adopted a kind of a short-term way of thinking that is also different from what our grandparents more commonly used.

In the markets, Congressman Bartlett said global warming is the biggest market failure in history. I kind of agree with that. If you look at the markets, the short-term focus is just dominant now. Quarterly reports, day traders, if you look at the entertainment business and the media business and even the news business, it is overnight polls and how many eyeballs can you glue to the screen. You know the phrases.

And in the honorable profession of politics back in that year when I first came to serve on these two committees, I never took a public opinion poll. And that was partly because, back in those days, it wasn't very common and also as Congressman Gordon knows, it is largely a rural district and you get out and meet people. But that has all changed now. And by the time I left politics, overnight polls were common. Now, as you all know, the so-called dial meters, it is just one long continuous poll. And I don't think the results for our democracy are all that good.

But this short-term focus is a part of the problem that we call the climate crisis. And we in the United States of America and you in the Congress are the repository of the hopes and dreams of people all across this Earth.

It is an unusual time.

One of the popular movies out there now is 300, about the small group that defended a pass at Thermopylae to save the prospects for democracy.

There are times, rare though they be, when a relatively small group is called upon to make decisions and show courage because the results of what they do will shape the prospects not only for

themselves and for their kin, but for all future generations. This Congress is now the 535; really and truly, it is one of those times.

Congressman Dingell, you are perhaps the youngest member of the Greatest Generation having thought fought in World War II as a very young man. And we owe you and your generation—as we have all acknowledged many times—a great debt. But you were part of a relatively small group that saved the world.

And when you and your colleagues, on the ground and at sea and in the air, won the struggle against global fascism in the Atlantic and the Pacific simultaneously, your generation came back home transformed, no longer 19-, 20-, 21-year olds, having walked through the fire, having emerged victorious; you came home with a different capacity for vision, a deeper moral authority.

And when your wartime leaders, like George Marshall, said, we ought to lift up our adversaries from their knees and walk with them from the battlefield toward peace and prosperity, we need a European Recovery Program, that became known as the Marshall Plan. Your generation said, yes, we don't want to have a repetition of these world wars coming out of Europe, but you knew it took vision and a 50-year time frame.

The United Nations was established. Taxes were involved. The "GI's General" Omar Bradley, said "It is time that we steered by the stars and not by the lights of every passing ship." And your generation said, yes, that's right.

And here in the Congress, Republicans, Arthur Vandenberg and others, stood up and reached across the aisle and said, we are Americans first. And Democrats reached across from the other side. And under Presidents of both parties, we stood down communism. And for 50 years, we were faithful to that mandate.

I say all that, Mr. Chairman, because what we are facing now is a crisis that is by far the most serious we have ever faced. And the way we are going to solve it is by asking you on both sides of the aisle to do what some people have, as you know, begun to fear we don't have the capacity to do any more. I know they are wrong. I know that politics can seem frustratingly slow, like it doesn't move but an inch a year. But when there are enough people who become seized of the gravity of the challenge and talk with you and you yourselves immerse yourselves in it and learn what is at stake, all of a sudden it can move very quickly.

I came here today, Mr. Chairman, with some messages to the Congress. And they will be delivered to your offices. They are from 516,000 people who just in the last few days have responded to an e-mail request that I sent out to say this hearing has been scheduled and I would like to be able to tell the members of these committees that I am not here by myself, there are lots of Americans who feel as strongly as I do. And so the folks that have contacted *Algore.com*, we have been getting 100 new contacts per second in the last couple of days. We just started this a short time ago.

This is building. And it is building in both parties. The faith communities, the evangelical communities, the business leaders, ten of the CEOs of the biggest corporations in America just the day before the State of the Union Address last month, most of them in their personal lives have been supporters of President Bush. That is irrelevant to this issue. They had a press conference the day before

the State of the Union Address calling on you to act, adopt legislation that will address this crisis. These are not normal times.

Congressman Gordon, I want you to tell Peyton happy birthday, and I felt the emotion in your voice as you got to the end of your statement. I have felt that, too.

Because I promise you, I say this to each of you as individuals, I promise you, the day will come when our children and grandchildren will look back. And they will ask one of two questions. Either they will ask, what in God's name were they doing? Didn't they see the evidence? Didn't they realize that four times in 15 years, the entire scientific community of this world issued unanimous reports calling upon them to act? What was wrong them? Were they too blinded and numbed by the business of political life or daily life to take a deep breath and look at the reality of what we are facing? Did they think it was perfectly all right to keep dumping 70 million tons every single day of global warming pollution into this Earth's atmosphere? Did they think all of the scientists were wrong? What were they thinking?

Or they will ask another question. They may look back, and they will say, how did they find the uncommon moral courage to rise above politics and redeem the promise of American democracy and do what some said was impossible and shake things up and tell the special interests, OK, we have heard you and we are going to do the best we can to take your considerations into account, but we are going to do what is right?

I am going to do my part to make sure that you have all the support that I and lots of other folks can muster for you in both parties when you do the right thing. If some of you in tough districts face pressures that just are overwhelming, I would ask you to walk through that fire.

I have got a few specific suggestions that I would like to make and thank you for the courtesy of giving me a longer than normal opening statement.

First of all, the new evidence, let it be said here, that has come out just in the last few months shows that this may well be even worse than has been described. Three days ago, two new studies were reported in the peer-reviewed science journal, Journal of Science magazine. One of them shows that the arctic ice cap is melting more rapidly than had been predicted. One of them shows that it could completely disappear in summertime in as little as 34 years. Most of the computer runs—and this is a respected computer modeling group, peer-reviewed—stretch it out 35, 45, 55, could be as little as 34 years.

This problem is burning a hole in the top of the world in the ice cover that is one of the principal ways our planet cools itself. If it goes, it won't come back on any time scale relevant to the human species.

Another study shows that the Earth is shaking because of what is going on in Greenland. Glacial earthquakes, seismographers all over the planet are hearing them; 1993, there were seven of them, between 4.5 and 5 on the Richter scale; by 1999, the number doubled to 14. This past year, there were 32 between 4.6 and 5.1 on the Richter Scale.

One of the science magazine articles I referred to points out in detail why the international scientific report decided that it was impossible to include the fate of Greenland and west Antarctica in their projections because they don't understand how this could be happening so quickly.

Another study shows that among the billions of tons of frozen methane in the Tundra areas that have locked it up in ice, melting is proceeding more quickly than anyone had predicted. Methane is much more powerful as a global warming gas than CO^2, about 23 times, they say, as powerful. We need to turn the thermostat back down before that melts.

Fires, some of you all from the west have had a terrible time with fires. New study correlates it precisely with the warming temperatures; and not just the warming temperatures, the earlier spring, the earlier melting of the snow pack and the decreased precipitation available. You have got the study there, Congressman. Thank you.

And what it shows is that the drier soils lead to drier vegetation. And that means kindling. And the incidents of large fires in the west, in Russia, in Australia, they have what some are calling a thousand year drought now. It is correlated with these warming temperatures. There are many other signs that we do not have time to play around with this. We do not have the luxury of making it a political football and exercising politics as usual.

Here is what I think we should do. Number 1, I think we should immediately freeze CO^2 emissions in the United States of America and then begin a program of sharp reductions to reach at least 90 percent reductions by 2050. All of the complex formulas of how we might start reductions years from now and have a little bit in the first year and a little bit more in the second year, I think we need to freeze it right now, and then start the reductions.

Second, I believe—and I know how difficult this is to contemplate—but I believe that we should start using the Tax Code to reduce taxes on employment and production, and make up the difference with pollution taxes, principally CO^2. Now I fully understand that this is considered politically impossible. But part of our challenge is to expand the limits of what is possible. Right now we are discouraging work and encouraging the destruction of the planet's habitability.

We are also in a new world, Mr. Chairman. We have talked many times about the competitive challenges that America faces in an outsourcing world. And with information-technology empowering these developing countries with large and fast-growing populations and lower wage rates, our biggest disadvantage is in the area of our high wage rates. We don't want to lower our wages, but we shouldn't worsen that disadvantage by stacking on top of the wages the full cost of our health and welfare and social programs. I understand this is a longer-term shift. But we ought to start making that shift. It would make us more competitive. It would also discourage pollution while encouraging work.

I understand how difficult it is, I will say again, but carbon pollution is not presently priced into the marketplace. It does not have a price tag. It is considered an externality. And there are reasons for that. But if you think about the externalities, they include air

and water. I internalize air and water, as most of us do. And I think the economic system should, too. And I think that one way to do it is by this revenue-neutral tax shift.

Third, a portion of those revenues must be earmarked for those in lower-income groups who will have a more difficult time making this transition unless you in the Congress make sure that we are giving them the assistance that they need.

Fourth, we need to be part of a strong global treaty. Now, I am in favor of Kyoto, but I fully understand that Kyoto, as a brand if you will, has been demonized. I remember, Mr. Chairman, when I first came to this Congress, one of the issues I worked on was nuclear arms control. Some of the Members here I worked with closely. In those years, Former President Carter had a treaty pending the SALT II treaty. And for a variety of reasons, including the invasion of Afghanistan by the former Soviet Union, it was withdrawn, and the name itself became a political liability.

President Reagan was elected. And I worked across the aisle with President Reagan on arms control. And after only a couple of years in office, he came to a realization, we need nuclear arms control. He had been against it but the realities of the situation made it clear that we needed to move forward.

And he came up with even deeper reductions and a new name called the START Treaty, and people who had been opposed to SALT II all of a sudden were in favor of the START Treaty.

I think that we should work toward de facto compliance with Kyoto. If we can ratify it, fine. But, again, I understand the difficulty. But we should work toward de facto compliance.

And here is my formal proposal. We ought to move forward the starting date of the next treaty now scheduled to begin in 2012, to 2010 so that whoever is elected President and is sworn-in in January 2009 can use his or her political chips, if you will, all of the good will that comes out of that election campaign and the new inauguration, not just on trying to fight a rear guard action in a bitter battle to ratify a treaty that will expire by the time it is ratified, but to work toward de facto compliance and then start an all out sprint to negotiate and ratify a new tougher treaty that will begin in 2010.

And we have to find a creative way to build more confidence that China and India and the developing nations will be a party to that treaty sooner rather than later. Land cover and methane and soot may be opportunities to have provisions that are binding upon them sooner rather than later, but some creative way must be found to make them a part of this effort.

Next, this Congress should enact a moratorium on the construction of any new coal-fired power plant that is not compatible with carbon capture and sequestration. And that means that we should have an all-out push to develop carbon capture and sequestration.

Next, I believe, Mr. Chairman, that just as this committee and the Science and Technology Committee were instrumental in the early years of assisting the scientists and engineers to take what was then known as ARPA-Net and DARPA Net and develop the new switches and the new high-performance computers and assist them in their creation of what became the Internet, that I believe this Congress should develop an ElectroNet, a smart grid. Just as

the widely distributed processing of information everywhere in this country and around the world led to the biggest new surge of productivity that we have ever seen in this Nation, we ought to have a law that allows homeowners and small business people, to put up photable generators and small wind mills and any other new sources of widely distributed generation that they can come up with and allow them to sell that electricity into the grid without any artificial caps at a rate that is determined, not by a monopsony—as you know, that is the flip side of a monopoly. You can have the tyranny of a single seller; you can also have the tyranny of a single buyer. And if a utility sets the price, it will never get off the ground. But if it is a tariff, if it is regulated according to the market for electricity the same way public utility commissions do it now, then you may not ever need another central station generating plant. In the same way that the Internet took off and stimulated the information revolution, we could see a revolution all across this country with small-scale generation of electricity everywhere. And let people sell it. Don't reserve it for the single big seller.

Next, I believe that we should raise the CAFE standards, and I support your initiative, Congressman Markey. But I support your idea, Chairman Dingell, as well, that it ought to be part of a comprehensive package. And I have taken note of your statements and also some of the automobile industry statements that as long as it is part of a comprehensive package that includes the utilities and includes buildings and all the other sources—don't single out cars and trucks and pretend that that is all the problem. It is only a slice of the problem. And it is not even the biggest part of it. But it is a big part of it.

Make it a part of the comprehensive solution. But let's not bring up the rear anymore on these auto standards. Basically, the problem is cars, coal and buildings, so you have got to address all three of them in an intelligent way.

Next, I believe that, along with using the tax system and a cap and trade treaty approach, you should also not shy away from using the regulatory power. And I believe that this Congress should set a date in the future for the ban on incandescent light bulbs, give the industry enough time to make sure they have got all of the socket sizes worked out and all of the different features, like dimmers and the rest that people want and to improve the quality of life. They will do it. You set the date.

Tell them we are not going to be able to sell that old, inefficient, wasteful kind at a set date in the future. They will adjust. As long as everybody plays by the same rules, they will adjust, and they will surprise you.

Next, where buildings are concerned, I would like to see you pass a law that I call Connie Mae, a carbon-neutral mortgage association and here's why. I used to be, in a small way, in the homebuilding business when I came back from the Army and before I was elected to the Congress. And the selling price of a new house is something the market is very sensitive to. Some of you all know this a lot better than I do because you have been in the business in a bigger way. And so the selling price is what people look at, both the sellers and the buyers. But all of the things that we need

to do to cut back down on carbon emissions are things that add to the selling price but don't pay for themselves until a couple or 3 years have passed.

And so the appropriate thing of insulation, the window treatments, the improvements that will sharply reduce the operating costs of that home or building is routinely excluded from the initial purchase price because the market discriminates against it.

We ought to set up a carbon-neutral mortgage association where all of those costs are set aside. They will pay for themselves. But just like Fanny Mae and Freddie Mac, put them in an instrument that is separate from the purchase price, and when you go to closing on a house, you sign the mortgage, and they will say, well, now here is your Connie Mae home improvement package here. You don't have to worry about paying for that because it will pay for itself. The Congress of the United States has made sure of that. I recommend that strongly.

Next, I think that you ought to require this committee, the Commerce Committee oversees financial services. I think the FCC ought to require disclosure of carbon emissions in the corporate reporting. Just the day before yesterday, the largest pension funds in this country, $4 trillion worth of assets managed by them, called upon the FCC and the Congress to require disclosure because it is a material risk. There are lots of companies where investors need to know if there is an exposure to carbon constraints, if they are going to be in real trouble because of some aspect of the climate crisis that they are not disclosing to their investors. Stockholders ought to know that, and those disclosures ought to be required.

Now I want to close, Mr. Chairman, and thank you and thank all of you again for the courtesy of allowing me to present these ideas to you.

I would like to close by referring back to the unprecedented nature of the challenge. As many of you know, the way the Chinese and the Japanese, both of whom use the so-called Kanji characters, express the concept of crisis, they use two symbols together. And the first one means danger, and the second one means opportunity. This is the most dangerous crisis we have ever faced. But it is also the greatest opportunity we have ever been confronted with.

And there are people who look around the world, Mr. Chairman, and look at the genocide in Darfur and the chronic civil wars and, in places like the Congo, fought by child soldiers; and they look at the tens of millions that die of easily preventable diseases and the destruction of the Asian fisheries and the rain forest and these other things; and they say, we just have all of these problems, isn't it terrible?

Well, there were problems back in those days after World War II as well. But when your generation rose to meet them, the vision they acquired in facing down fascism served them well in giving them the ability to see that these other challenges were not political problems; they were moral imperatives. And that is what our opportunity is today, not only to solve this and to say to the future generations, we did our part, this was our Thermopylae, and we defended civilization's gate, and we rose to the challenge; but to also say, in the process, we dug deeply, and we found a capacity we didn't know we had. It is there. We all know that. And that is what

will give us the ability to successfully solve these other crises. That is the greatest opportunity of all that comes out of this climate crisis.

It really is up to this Congress, and Mr. Chairman, and to all of you, I cannot possibly overstate the strength of the hope and good feeling that people all over this country have about this Congress and the new approach that they feel is being taken here. And I am going to be out there, as I said, trying to stir up as much support for you all doing the right thing as I possibly can. I wish you well as you undertake this historic challenge.

Thank you.

[The prepared statement of Mr. Gore follows:]

Testimony of the Honorable Al Gore

before the
U. S. House of Representatives
Energy & Commerce Committee
Subcommittee on Energy & Air Quality
and the
Science & Technology Committee
Subcommittee on Energy & Environment

March 21, 2007

Chairman Dingell, Chairman Gordon, Congressman Barton, Congressman Hall, and members of the Subcommittees. I want to thank you for the gracious invitation to be with you today, giving me an opportunity to return to the House to talk about the climate crisis.

I want to testify today about what I believe is a planetary emergency—a crisis that threatens the survival of our civilization and the habitability of the Earth. Just six weeks ago, the scientific community, in its strongest statement to date, confirmed that the evidence of warming is "unequivocal." Global warming is real and human activity is the main cause. The consequences are mainly negative and headed toward catastrophic, unless we act. However, the good news is that we can meet this challenge. It is not too late, and we have everything we need to get started.

As many know, the Chinese expression for "crisis" consists of two characters side by side. The first symbol means "danger." The second symbol means "opportunity." I would like to discuss both the danger and the opportunity here today.

First of all, there is no longer any serious debate over the basic points that make up the consensus on global warming. The ten warmest years on record have all been since 1990. Globally, 2005 was the hottest of all. In the United States, 2006 was the warmest year ever. The winter months of December 2006 through February 2007 make up the warmest winter on record. These rising temperatures have been accompanied by many changes. Hurricanes are getting stronger. Sea levels are rising. Droughts

are becoming longer and more intense. Mountain glaciers are receding around the world.

New evidence shows that it may be even worse than we thought. For example, a recent study published by the University of Alaska-Fairbanks indicates that methane is leaking from the Siberian permafrost at five times the predicted levels. Methane is 23 times as potent a greenhouse gas as carbon dioxide and there are billions of tons underneath the permafrost.

However, there is a great deal of new momentum for action to solve the climate crisis. Today, I am here to deliver more than a half million messages to Congress asking for real action on global warming. More than 420 Mayors have now adopted Kyoto-style commitments in their cities and have urged strong federal action. The evangelical and faith communities have begun to take the lead, calling for measures to protect God's creation. The State of California, under a Republican Governor and a Democratic legislature, passed strong, economy wide legislation mandating cuts in carbon dioxide. Twenty-two states and the District of Columbia have passed renewable energy standards for the electricity sector. Much more needs to be done, but change is in the air.

I do not believe that the climate crisis should be a partisan political issue. I just returned from the United Kingdom, where last week the two major parties put forward their climate change platforms. The Tory and Labour parties are in vigorous competition with one another—competing to put forward the best solution to the climate crisis. I look forward to the day when we return to this way of thinking here in the U.S.

The climate crisis is, by its nature, a global problem—and ultimately the solution must be global as well. The best way - and the only way - to get China and India on board is for the U.S. to demonstrate real leadership. As the world's largest economy and greatest superpower, we are uniquely situated to tackle a problem of this magnitude.

After all, we have taken on problems of this scope before. When England and then America and our allies rose to meet the threat of global Fascism, together we won two wars simultaneously in Europe and the Pacific.

This is a moral moment of similar magnitude. This is not ultimately about any scientific discussion or political dialogue. It is about who we are as human beings and our capacity to transcend our limitations and rise to meet this challenge.

The solutions to this problem are accessible, but politically - at least in the near term - seem quite difficult. In practice, however, they will turn out to be much easier than they appear to us now.

For example, the Montreal Protocol on Substances that Deplete the Ozone Layer first negotiated in the 1980's was opposed by industry for fear it would hurt the economy because its provisions were too stringent. However, governments and industry rose to meet the challenge and the treaty was strengthened twice in quick succession to quickly ramp down the chemicals that were causing the hole in the ozone layer.

There are some who will say that acting to solve this crisis will be costly. I don't agree. If we solve it in the right way, we will save money and boost productivity. Moreover, the consequences of inaction would be devastating to both the environment and the economy. Recent reports make that clear.

When I think about the climate crisis today I can imagine a time in the future when our children and grandchildren ask us one of two questions. Either they will ask: What were you thinking, didn't you care about our future? Or they will ask: How did you find the moral courage to cross party lines and solve this crisis? We must hear their questions now. We must answer them with our actions, not merely with our promises. We must choose a future for which our children and grandchildren will thank us.

Chairman DINGELL. The committee thanks you for your presence and for your very valuable statement and for your help.

I want to welcome you back. We have worked together in this room for a lot of years, you and I, and you have made a valuable contribution to the public in this room for which we are all thankful, and I want to appreciate your recalling the friendship that has existed between our two families for more years than I think either of us can remember. And I want to tell you my personal appreciation.

The Chair will note that I am going to defer on questions, and I am going to begin by recognizing my colleagues for questions for 5 minutes. We are going to adhere to those 5-minute limitations very carefully.

The distinguished gentleman from Tennessee, the chairman of the Science and Technology Committee.

Chairman GORDON. Thank you, Mr. Chairman.

Mr. BARTON. When we deferred, at least I understood that we would have that additional opening statement time to ask questions. Have you changed your mind about that?

Chairman DINGELL. I haven't changed my mind at all. If the gentleman wishes, he could have that additional 5 minutes. The Chair does remind him, however, that 5 minutes at this level is going to deny members at the other levels 5 minutes as the gentleman is fully entitled to take his time, and we will respect that. Some of us will probably respect it more than others.

The Chair recognizes now the distinguished gentleman from Virginia, Mr. Boucher.

Did you want your 5 minutes?

Chairman GORDON. Yes, sir.

Chairman DINGELL. The Chair apologizes, and the gentleman from Tennessee is recognized for 5 minutes.

Chairman GORDON. I want to recognize Sherie Boehlert, the former chairman of the Science Committee in our audience today, and I think Sherry represents how this really can be and should be a bipartisan solution. Sherry has been a long advocate of the concerns about climate change, and we are glad you are here.

My friend and ranking member on the Science Committee, Mr. Hall, raised a good question earlier, and so I want to follow up on that. And that is the cost. What is going to be the cost associated?

And I notice, Mr. Vice President, in your written statement, you made the following statement, and I quote, "There are some who will say that acting to solve this crisis will be costly. I don't agree. If we solve it the right way, we will save money and boost productivity."

Would you mind elaborating on that?

Mr. GORE. Thank you very much, Mr. Chairman. I meant to acknowledge Chairman Boehlert, and I want to thank him publicly for agreeing to work with me on the Alliance for Climate Protection, which is a bipartisan group. Larry Schweiger with the National Wildlife Foundation, another board member, is here. Brent Scowcroft is on the board. Lee Thomas, President Reagan's former EPA head, is on the board.

On July 7, we will launch a 3-year mass persuasion campaign, completely bipartisan in nature. It will involve television and radio

advertisements in all of your districts, a very active net-based campaign. This is not going away. The problem is not going away. It is getting worse. The efforts to build public support for a solution to it are going to be increasing steadily, and I thank former Congressman Boehlert for his part in that.

Now, on the cost, I remember back on the Science and Technology Committee, we used to get testimony from this fellow at the Rocky Mountain Institute Amory Levins. He is one of these guys that is so smart, you feel like you are drinking out of two fire hoses at the same time. And he doesn't get as much attraction for his ideas as he should because people can't keep up with him, can't understand him always. But he has been right for 30 years on a lot of this.

And one of the things he used to say in talking about the cost of this, the alleged cost, the solutions he said, "They have got the sign wrong. They have got the sign wrong." Well, see, I thought he was so smart, I thought he was talking about trigonometry with cosigns and whatever the rest of that stuff is. And then I realized, no, no. He has brought it down to where I can get to it. He is talking about a plus sign and a minus sign, and what he means is that if you go about this in the right way instead of putting a minus sign in front of the expenditures that are needed to solve this crisis, you need to put a plus sign in the sense that it is going to save you money, and it is going to help make the economy stronger.

Harry Truman once said, when he was President, he said, "I spend 95 percent of my time trying to convince people to do things that they ought to damn well do for their own benefit anyway." And sometimes the people who really work with the details of the solutions of the climate crisis feel exactly the same way.

Now it is not that easy because when you look really closely at it, there are some solutions that have minus signs as well as plus signs.

But let us take, for example, in Sweden, they have this program to have zero-carbon buildings. OK. And in some areas, you can't do it unless it is zero-carbon. Well, the people that do that, they put in the expenditures for more insulation in the window treatments, and they use the new computer-assisted design to orient to the sun just right, and there are things they can do now that are fairly simple once they understand what they are doing. And it ends up being zero-carbon. Well, it more than pays for itself. And that is an example of a plus sign where we are going to benefit from the expenditures.

There are some other approaches that would be costly. But if we pick and choose correctly, we can improve our economy's productivity and performance and save money.

Now this is not some alchemy or some mysterious process. Pollution is waste. You have got to buy raw materials in order to make pollution. And if you can figure out how to be more productive and put more of those raw materials into your product and less into the waste stream, you are going to save money in the process.

Now the Stern report came out in the United Kingdom, and I was asked to serve as an adviser to the government over there. It has been an interesting process. And incidentally, I just came back from there this past week. And I will say this to my friends on the

Republican side of the committee, over there, the Tories and the Labour Party are all on the same side on this. They are competing with one another vigorously. But they are competing on the basis of who can present the most effective solutions for it. They don't argue about the science. The debate on science is over with.

And so now the Stern report, which came out of there, said that the cost to our economy of not solving this crisis would be devastating. And so if we go about it in the right way, we can save money. If we don't confront the problem, the cost to the economy would be enormous.

I am sorry to take up your time.

Chairman DINGELL. The time of the gentleman has expired.

The Chair recognizes now the gentleman from Texas, Mr. Barton, for 5 minutes.

Mr. BARTON. Mr. Chairman, I would like the additional 5 minutes.

Chairman DINGELL. The gentleman will be recognized for 10 minutes.

Mr. BARTON. First. I do want to again welcome the Vice President. I sincerely don't agree with your conclusions, but I sincerely appreciate your passion and your willingness to try to make a difference. I honestly commend you for standing up for what you believe in and being willing to put your considerable prestige on the line.

Mr. GORE. Thank you, Congressman.

Mr. BARTON. I will point out in passing that your actual testimony bears little resemblance to your written statement. I would hope that we could get your legislative recommendations, which were numerous, in writing so that we could actually study them.

Will that be possible?

Mr. GORE. Could I have permission to revise and extend for the record?

Mr. BARTON. Yes, sir.

Mr. GORE. I will put all of this in written form.

Mr. BARTON. At least the legislative proposal.

Chairman DINGELL. If the gentleman would yield, the Chair is going to see to it that we leave the record open and that suggestion, Mr. Vice President it would be very much appreciated by the committee if you would be able to assist us in.

The gentleman from Texas.

Mr. BARTON. Thank you.

The first thing that I want to address is the science of global warming as portrayed in the Vice President's film, "An Inconvenient Truth". This is something that I think we absolutely have to get right. Even the mainstream media, Mr. Vice President, are now noticing that global warming science is uneven and evolving. We need to be deliberative and careful when we talk about so-called scientific facts.

In your movie, you display over a time line of temperature and compare it to CO^2 levels over a 650-year period as reconstructed from ice core samples. You indicate that this is conclusive proof of the link of increase CO^2 emissions in global warming. A closer examination of these facts reveal something entirely different.

I have an article from the Science Magazine, which I will put into the record at the appropriate time, that explains historically a rise in CO^2 concentrations did not precede a rise in temperatures but actually lagged temperatures by 200 to 1,000 years. Yes, lagged. CO^2 levels went up after the temperature rose. It appears that the temperature appears to drive CO^2, not vice versa.

On this point, Mr. Vice President, you are not just off a little; you are totally wrong. And it is not just this one article. The president of the National Academy of Sciences agreed under oath last summer in an O&I Subcommittee hearing on this very point.

We know that CO^2 levels have historically and repeatedly far exceeded the levels of concentrations that we are now experiencing, which you, in your opening statement, correctly said was 380 parts per million. Indeed, CO^2 levels in the past have exceeded over a thousand parts per million, and the average Earth temperatures have been much higher than they are today. We know these things. But because some of these levels occurred millions of years ago, reliable data regarding the details of these is limited. We do not know whether the temperature rose before or after the rise in CO^2 levels that far back.

But it remains a fact, and it is clear from the data that we do have that, for hundreds of thousands of years, CO^2 levels have followed temperature rise, not the other way around as you preach.

You have also asserted that global warming is going to cause sea levels to rise by over 20 feet. Twenty feet. The recent IPCC report indicates a rise of at most 23 inches. Inches. Twelve inches equals a foot.

You state that there will be more and stronger hurricanes because of global warming. The IPCC report does not support this claim.

You have also stated that malaria has been exacerbated in Nairobi because of global warming. The World Health Organization report does not support this allegation. In fact, malaria is not an exclusively warm weather disease. Inhabitants in Siberia have long experienced malaria outbreaks.

Your ideas aren't all bad, Mr. Vice President. You list a number of thoughtful responses to global climate change for this committee to consider. They include: more efficient use of electricity in heating, cooling appliances and lighting; more energy-efficient buildings and businesses; more fuel-efficient cars, both hybrid and fuel-cell cars; better designed cities, mass transit; and fuel-efficient trucks; increased use of renewables and carbon-capture and sequestration. These are good ideas. They are not just reasonable responses to climate change, but they are good energy policies as well.

We have before us one of your tables from your book, I believe, and I am happy to report that, in the last Congress, under the chairmanship of myself with the strong and able support of Mr. Dingell, the current chairman, we reported out and passed into law the Energy Policy Act of 2005 on a bipartisan basis. If we look at that piece of legislation, we will see that many of the things that you recommended, we have already done.

You want more efficient heating and cooling systems, lighting, appliances and electronic equipment. In the Energy Policy Act, we did that in titles I, IX, and XIII. You want end-use efficiency design

of buildings and businesses to use far less energy than they currently do. We did that in titles I, IX and XIII.

You want increased vehicle efficiency cars that run on less gas, and more hybrid and fuel-cell cars. We attempted to start that process in EPAct titles VII, VIII, IX, XIII and XV.

You want to make other changes in transportation efficiency, better use of mass transit systems and heavy trucks. We do that in title VII and IX.

You want increased renewable energy, wind, solar biofuels. We do that in EPA title II, VII, VIII, IX, XII, XIII, XV, XVI, XVII and XVIII.

And, finally, you think that we need to research and try to capture and store carbon from power plants and factories. We start that process in EPA titles IV, IX and XVII.

So, in many of the things that you recommend, we not only agree with you; we have already done it.

Some of your ideas, though, Mr. Vice President, I think are just flawed.

Your suggestion of a carbon tax is something that would harm our competitiveness, raise costs to American families, export jobs and actually do very little to improve our environment. Likewise, a Kyoto state cap and trade system for CO^2 will mainly increase the price of electricity while providing few, if any, environmental benefits. These proposals, especially considering that neither of them includes large emitters of greenhouse gasses, such as China and India, fail the commonsense test that any legislation should meet. They provide little benefit at a huge cost.

Instilling a carbon tax on the American people or instituting a cap on carbon without the participation of nations like China and India is an attempt to reverse global warming similar to a doctor telling an overweight and sedentary chain smoker that he or she needs to wear a seatbelt. China is adding a coal power plant a week and will add more coal-fired electricity generation this year than the entire State of Texas currently has.

When you were Vice President and you jetted into Kyoto to sign the Kyoto Protocol, you rejected requests of people like myself and Chairman Dingell to insist that China and the developing nations be included in that same protocol.

Let us look at what has happened in Europe as they have tried to instigate their carbon cap and trade. In Germany, electricity wholesale rates have risen 30 to 40 percent, and they are facing huge job losses. Despite all of the efforts of the European nations that signed Kyoto, almost none of those countries are on target to meet their Kyoto obligations. Cap and trade isn't working in Europe. It will not even be tried in Asia, and it should not be unilaterally imposed in the United States of America.

You just gave us an idea for a flat straight CO^2 freeze, if I heard you correctly. I think that is an idea that is flawed. If you take that literally, we can add no new industry, no new cars and trucks on the streets and apparently no new people because people are mobile source emitters. Every person emits 0.2 tons of CO^2 a year. So an absolute true freeze, no new industry, no new people and no new cars.

I think we need to approach a legislative initiative in these areas with an eye on four basic principles: we first want to be sure that it actually helps the environment. We want to keep our lights on at an affordable price. We want to keep the American economy strong, and we want to keep American jobs here in America. And, finally, we can't get out in front of things that are not technologically possible with at the current time, as I have noted.

On some of your ideas, we agree and we have already taken action. And hopefully in this Congress, we will take additional action.

Now I want to ask, in my last 19 seconds, this question. You said that you support a CAFE increase. Do you support the CAFE increase like they have in Japan that is over 45 miles per gallon, or do you support a CAFE increase more like they have in China which is around 35 miles per gallon, and what is your time frame for this increase that you do support?

Mr. GORE. Well, thank you very much, Congressman. I would like to respond to several of the things that you asked me about.

First of all, I think that the committees should be under no illusion about what the scientific consensus is. The National Academy of Science, not only in this country but in every major country in the world, has endorsed the scientific consensus and is calling upon you to act.

The IPCC, the most extensive and elaborate in-depth highest-quality international scientific collaboration in all of history, has now four times in the last 15 years, as recently as 6 weeks ago, unanimously endorsed the consensus.

Scientific American had a special issue in September saying the debate on global warming is over. The editor-in-chief of Science Magazine said it is very rare to have a consensus in science as strong as this one. One of the leading experts said it is a stronger consensus than on practically anything except perhaps gravity. So I think the consensus is, it is something that we ought to acknowledge and accept.

Now the fact that more CO^2 traps more heat in the lower parts of the Earth atmosphere is really beyond dispute. I mean, that is not me saying that. That is what the scientists have known for 180 years. And for a hundred years, they have done the calculations on pretty much exactly what the magnitude of the heating effect is.

And you know, for those who say that there may be some kind of magic solar system phenomena at work here, how come it is getting cooler in the stratosphere at the same time it is getting warmer in the troposphere, the lower atmosphere? That is exactly what the models predict.

Mr. BARTON. My time expired 2 minutes ago.

Mr. GORE. But if I could complete my response, Congressman.

Mr. BARTON. I hope there is an answer in this.

Mr. GORE. May I?

Mr. BARTON. I would like to have an answer to the straight question.

Mr. GORE. Well, you asked quite a few of them, and I am doing my best.

Now, on CO^2 and temperature, when CO^2 goes up, temperature goes up. That is why 20 of the 21 hottest years ever measured in the human record have been in the last 25 years. The 10 hottest

have been since 1990. The hottest was 2005. The hottest in the United States of America was 2006. The hottest winter ever measured globally was December of last year and January and February of this year, last month. This is going on right now. The planet has a fever. If your baby has a fever, you go to the doctor. If the doctor says, you need to intervene here, you don't say, well, I read a scientific magazine that tells me it is not a problem. If the crib is on fire, you don't speculate that the baby is flame retardant. You take action.

The planet has a fever. And 5 degrees may not sound like much the range it is in the range that is projected, but the difference between 98.6 and 103.6 is 5 degrees. We have to take action on this.

Now in the ice core record, as I have said every time I give my slide show, it is a coupled system. They go up and down together, and indeed, there have been times since the entire interglacial record is driven, the scientists tell us, by these cycles, the Earth orbits around the sun, gets thinner and wider. On a 100,000-year cycle, the tilt oscillates a degree and a half. On a 41,000-year cycle, there is a wobble called presession. On a 22,000-year cycle—and when those three overlap, it creates that historic pattern. That has been true for 3 million years.

Mr. BARTON. The temperature goes up before the sea level goes up.

Mr. GORE. Sometimes that has been true in the past. The opposite has also been true in the past. But what is happening now is that we, because of human action, are overwhelming all of those cycles.

Just a couple more brief points, if I could, Mr. Chairman.

There is no consensus linking the frequency of hurricanes to global warming, and I have never said there is. It is the intensity of hurricanes. It is also true the scientists say you can't take an individual storm and say, this is caused by global warming. But the odds of stronger storms are going up.

I see the gavel, and I would like to respond to the other three questions you asked, but in courtesy to the other members, I will try to weave them into other—I ask your direction, Mr. Chairman. Do you want me to briefly answer them now?

Chairman DINGELL. The Chair is in a pickle. I have a lot of Members that have to be heard.

Mr. GORE. I understand. I will answer the other questions for the record if that is OK.

Chairman DINGELL. That would be splendid. Without objection, so ordered.

We are going to see to it that there is broad opportunity for insertions in the record by all Members and by our distinguished witness.

The Chair recognizes now the distinguished gentleman from Virginia, Mr. Boucher, for 5 minutes.

Mr. BOUCHER. Thank you very much, Mr. Chairman.

And Mr. Vice President, we welcome you here this morning. Thank you for taking time with us and thank you, also, for the groundbreaking work that you have done in drawing global attention to the human contribution to climate change and the need to

control greenhouse gas emissions. We congratulate you on that work.

Mr. GORE. Thank you.

Mr. BOUCHER. We are planning in our committee for later this spring the drafting of a greenhouse gas control measure. We have not made decisions as of this point about the control methodology. And we are evaluating a number of different alternatives that could achieve significant reductions.

I would welcome your advice today on what those various methodologies might be. You mentioned in your testimony the possibility of a cap on greenhouse gas emissions followed by some form of emission trading program: We adopted such a program in 1990 in our Clean Air Act amendments applicable to sulfur dioxide emissions from coal-fired power plants, and that program has been a sterling success. In fact, it succeeded far better than even those of us responsible for drafting that thought that it would.

The European Union, on the strength of that success, decided to apply a cap and trade regime so it is—to satisfy in the Kyoto Treaty obligation on greenhouse gasses. But I think the consensus now after several years of experience with that in Europe is that their program was flawed. And so I would welcome your views this morning on what the Europeans did properly with regard to their cap and trade; what they did not do properly; and what could have been done better; and your evaluation of whether cap and trade is an approach that we should seriously consider for adoption here in the U.S. as we devise an approach to greenhouse gas controls.

Mr. GORE. Well, thank you, Mr. Chairman. That is a great question, and I do recommend a cap and trade approach, and when the first President Bush first proposed the sulfur dioxide cap and trade system, I was a supporter of it, but you are right. Even the most enthusiastic supporters underestimated how effective that was. We got much sharper reductions at much lower costs. Trust the market. Make it work for us instead of against us.

Now the European system is in fact working, and it is beginning to work extremely well. I disagree respectfully that they are not meeting their targets. It is a Europe-wide target, and they are going to be on track to meet it. It is not individual countries. Some of them are ahead of their internal targets. Others are behind. As a region, they are not only meeting them; they just adopted binding targets last week when I was over there that go much deeper than their obligations under Kyoto, a 20 percent reduction, and they will take it to 30 percent if we join in the regime. So they are finding that it is much easier to do, and they are moving more quickly.

Now here is what they did wrong when they started. They miscalculated their base year, and so, since all of the reductions have to be measured against the base year, it matters a lot if they get that wrong. They also had a first phase, a start-up period that was way too long. Now they have recognized that, and they have adjusted both of those things. They are really on this case. At the prime minister level, they had all of them meeting just last week. This is the number one issue over there in lots of those countries, and again, as in the UK, it is bipartisan. It is across the party lines, and people are up in arms about it. And the business leaders

are demanding that the government act, and the governments are acting. So I think they fixed the two problems that they had.

Now, the U.S. is about 23 percent of the ongoing annual carbon emissions. On a historic basis, we are responsible for about 30 percent of the CO^2 that is up there, and if we stop completely tomorrow, it would be a hundred years before half of it fell out. So it is a difficult challenge. But since we are not participating in the cap and trade system, it is a little bit like a bucket with a hole in it. You can still use a bucket with a hole in it, but it will be a lot more efficient if that 23 percent hole is plugged. Then what you will find is the global market in carbon trading will reach much higher levels of efficiency.

Now, here is what it is doing at the company level. I gave the keynote speech last week at a conference called Point Carbon, where they had companies from all over the world, simultaneous translation through Japanese, that and the other. And they are focused on how this trading system works.

A year ago, at the same conference, they did a study of the thousands of companies represented there and asked them how many of these companies are reducing internally their carbon and managing it. It was 15 percent. Last week, this year, 65 percent. So, just in 1 year's time, you have had that big increase. And I think the same thing is beginning to happen here in this country.

Mr. BOUCHER. Thank you, Mr. Vice President.

Chairman DINGELL. The time of the gentleman has expired.

The Chair recognizes now the distinguished gentleman from Texas, Mr. Hall, for 5 minutes.

Mr. HALL. Mr. Chairman, thank you.

And Al, I do respect you and your great family, and I am older than Mr. Dingell, and I remember the services of your father that worked alongside our Sam Rayburn. And I have read of and some people think I remember Sam Houston, another great Tennessean.

Mr. GORE. Also from Tennessee.

Mr. HALL. And Bart Gordon is really helping me. I don't know that he really realizes it or not, but he is a great guy and a Tennessean, and I never met a Tennessean that I didn't like, honestly. Barton says that every time somebody left Tennessee and came to Texas, it raised the character in both States. That is a good statement to make.

But I have to differ with you on some things, and let me tell you. I have admired you. We sat right side by side on these committees and worked together. We held a conference one time, a hearing on my boat out in front of Thomas Jefferson's home there.

Mr. GORE. Yes.

Mr. HALL. And when your little one was injured, you had the prayers of everybody up here.

Mr. GORE. Thank you.

Mr. HALL. And you are dear to us, but I just don't agree with you on this. But Bart mentioned, and I want to thank him for mentioning it, he mentioned it himself, I heard him say cost. That is 12 times that we heard it here in just a little bit. If you say it costs nothing now, and I think you said "There are some who will say that acting to solve this crisis will be costly; I don't agree." Then you go on to say some ways to where it won't be costly, but I think

that you are going to—we are going to hear from Dr. Lomborg here in just a little bit. In his testimony, he said, and we are talking about the Kyoto Protocol, which even if it had been successfully adopted by all signatories, including the United States and Australia, and even if it had been adhered to throughout the century, it would postpone warming by just 5 years in 2100. That is 90 years from now; 89 years from now, I believe. I am not good at math. At a cost of $180 billion annually, and it would hold off global warming 4 years. That doesn't look like a very good deal to me, and who is going to pay for it?

Ask China what they think about paying for it. Ask Mexico. Ask India. Ask a number of other countries. My question, though, to get around to my question is that, if the United States and China and India do not incur the cost of reducing their emissions—at the same time, are you concerned that the United States will be at a competitive disadvantage?

Let me go a little further. If developing countries are not required to take action at the same time as the United States, what will happen to the United States manufacturing sector when you add in the costs of reducing emissions to the products produced domestically versus those products produced overseas that do not incur such costs at the same time?

I guess my question is, how would you prevent the United States manufacturers from being harmed?

Mr. GORE. Well, Congressman Hall, Ralph, if I may, thank you so much.

I was thinking, remembering fondly that evening on your boat out there, and I would love to do that again some time.

Mr. HALL. We will do it any time you want to.

Mr. GORE. Thank you. I enjoyed working with you when we were on the committee together, and I really do believe what I said earlier, Ralph, that we have got to find a way to reach across the aisle on this and recreate what used to be a bipartisan consensus in support of the environment here in this Congress, and even when these measures, like the ones we are talking about here, are involved.

Now, on China and India, it is a very serious challenge and here is the reality of it: Every single global treaty since the end of World War II has had the same basic design. The countries that have higher per capita incomes are put in one category, and the countries that have, just one one-hundredths in some cases, of what the per capita income in Europe, Japan, the U.S. is, they are in another category. And they say, look, we don't have the ability to bear that burden in the same way. We don't have the technologies, and you all created this problem. You start, and then we will come along.

And in every treaty that has been written since 1945, that has been the approach that has had to be taken. I wish it to be otherwise. But in a negotiation, when you have got all of these power countries banding together, nobody has found a way to crack that walnut open with another kind of formula. The way to improve the odds that they are going to come on board is for the United States to take the lead.

Now we have got something else going for us, and that is that these countries now are beginning to understand very clearly that they have to act in their own self interest. You take China, for example. Both the Yellow River and the Yangtze River originate on the ice fields on the Tibetan Plateau. They are having terrible water shortages in many parts of China, particularly northern China. They are having terrible pollution problems related to their coal expenditures. They now have these mass demonstrations over there, believe it or not. They are not covered in their news media, of course, but they are really having a difficult time. That is why their two top leaders have both made important speeches just in the last 2 weeks saying that they have got to address this; they have expressed their determination, too.

I don't put much stock in those words until they follow it up, but the way to improve the odds, if they do, is for us to show the leadership. And I think most of what we do is going to make us more competitive with them.

Mr. HALL. My time is up, but I just want to tell you that negotiations spawn treaties, and every negotiation we have had from China, Lord knows, I have heard the word no when it comes to talk about cost.

Chairman DINGELL. The gentleman's time has expired.

Mr. HALL. And I yield back my time.

Chairman DINGELL. You owe us about 15 seconds.

The Chair recognizes the distinguished chairman, Mr. Lampson.

Mr. LAMPSON. Thank you, Mr. Vice President, for joining us today. Your public service is most appreciated.

In 1945, the United States Army published a book cautioning our country about our reliance on fossil fuels. It has been 62 years since that message was published, since that statement was published. Even you with your message, your positions that you have held have been—you have had a very difficult time getting the message out to the rest of this world, but your relentlessness is hopefully going to pay off, and I thank you for that.

I have two questions if I can get them both in.

First, if we take action to address our climate change challenges, don't we also address many other problems that we face? For example, can we also achieve air quality benefits, greater energy independence and reduced traffic congestion and maybe even more? And would you comment on that, please?

Mr. GORE. Is that both of your questions?

Mr. LAMPSON. That is just one.

Mr. GORE. Yes, I think that is absolutely the case. And there was an effort to include the CO^2 pollution in with the other pollutants so that the utilities could address them at the same time when they modernize and update, and I still think that is the way to go. But there is no doubt that if you cut down on the global warming pollution, you are also going to make the air cleaner. Asthma rates will likely go down. Lung diseases will likely be less severe. Congestion, if we enact some of the sensible solutions on transportation, yes, you will solve some other problems that need to be addressed anyway. I agree with you totally.

Mr. LAMPSON. So significant potential savings. As we probably all know, coal is the least expensive and the most abundant fuel

that we have in this country and the fuel that is most available in India and China as well. Recently, in Texas, TXU had a plan to build eight new coal-fired plants, and that caused a great deal of controversy due to the concerns about air quality and carbon dioxide emissions. What do we need to do to make clean coal viable? And what are the key areas of research and investment that we need?

Mr. GORE. Well, first of all, I want to compliment the people of Texas who rose up en masse to block that cynical plan by TXU to move forward. And you know, if you look at what happened, it was Republican mayors alongside Democratic mayors, virtually every significant mayor in the State of Texas was involved in protesting that going forward. You and your group, Nick, were just terrific in that. And this is a grassroots movement. And it is bipartisan.

And now to your question, we need to make sure that we accelerate the development of carbon capture and sequestration. And we need to avoid the easy assertion that if you just use it for enhanced oil recovery, that is sequestering it, because the geological deposits have to be ones that are not porous. We can't pretend that it won't come back up through if it is put in the wrong places. But if it is done right, then this does open up the opportunity to continue using coal.

Now, pulverized coal, according to the old approach where they just heat it up, then you are producing so much nitrogen along with the CO^2, there is no way to capture it. New designs with oxygen enrichment—this is above my pay grade—but they say there are ways to design these plants that make them capture and sequestration friendly.

Now, a lot of times, the problem is, you have to have the geological formation close enough to the coal deposits and also close enough to the places where you are going to sell the electricity to make it all economically feasible. The places that are doing the best job appear to be Norway and Iceland. And they are storing it offshore under the seabed where the water pressure holds it in place safely. But coal's future depends on getting an accurate price for carbon in the marketplace and the speedy development of carbon capture and sequestration technology.

Mr. LAMPSON. Thank you very much. I have other questions. I would like to submit them for the record, and I yield my time.

Chairman DINGELL. Without objection, so ordered.

The Chair recognizes now the distinguished gentleman from Illinois, Mr. Hastert, our former Speaker, for 10 minutes.

Mr. HASTERT. I appreciate this opportunity, Mr. Chairman.

Mr. Gore, welcome back to the Energy and Commerce Committee. We appreciate you and Professor Lomborg appearing before us today to discuss the very important issues surrounding global climate change. I listened to you and sometimes in wonderment, and we talk sometimes in very general language and talk about modernizing and upgrades. We talk about capital investment, research and development. But all of those have costs, and you are able to develop to be able to pay for things, costs, you go two places. You can tax the American people and tax the American industry, or you can have the old fashioned way, the things that our Forefathers did

basically is have economic activity and market economy and investment and coming from the free market and people's pockets.

There are two ways to get money out of people's pockets: investment and taxing. I was somewhat amazed to go through your 10 or 15 issues here or your recommendations. I think a lot of those recommendations I can agree with. But a lot of those recommendations are more regulation and more taxation. And we find out in this economy, this world, when we tend to regulate, when we tend to tax, you depress the ability of the free market to work. And sometimes people in this dark side of the aisle, as you said, talk about less regulation and less taxation to make our economy work to give the free people freedom to invest.

Let me just say, Mr. Vice President, I agree with you. I agree with you that the debate over climate change is over. I believe the Earth climate is constantly changing. As a farmer, I could tell you that I see evidence of this fact every year. Any one of my constituents can tell you the same thing, and I also agree that the science tells us the Earth's average temperature increased in the 20th century, and financially, I agree with you that human activity and economic development has an impact on our environment.

But I am less certain about the nature and extent of man's contribution. But we will let history debate and determine what that is.

The fact is, you have laid out some things and places that we need to go. And as a thinker, as a personality and now a movie star, you can come back with those general themes, those broad things and say, "Do this."

Mr. GORE. Rin Tin Tin was a movie star. I just have a slide show.

Mr. HASTERT. The fact is, I have pledged my cooperation with Mr. Dingell the esteemed chairman of this committee, and Mr. Boucher, who is the chairman of the Energy Subcommittee. I think there are answers. But the fact is, 50 percent of our energy is coal. There is more energy under Gillette, WY, than there is in all of Saudi Arabia. We have the potential in States like Virginia and Kentucky and southern Illinois and southern Indiana and Wyoming and Montana and others to be able to harness that energy, but it happens to be coal energy.

We also have natural gas. We have some oil. But we can't sustain the need for the growth in energy in this country that we are going to need in the next 10 years, a 40 percent increase, because we do have an increase in population. And although our population has curved down, probably doesn't keep up with the rest of the world, but that is a fact. I have a new grandson. I am proud of it. I hope he has grandsons to come.

But that is the fact, that we are going to have to have that growth. So how do we meet that? How do we do it? How do we find the new technologies and the new ideas and the new sciences to be able to do it? Nine times out of 10 it is going to be individual investment. It is going to be people saying, this is a good idea, I am going to put money in this idea, and I am going to help create a better world because of it, and by the way, we may make a little profit off of it on the side. And that just happens to be how this country works.

So I think we can find answers to use the coal energy, to use the natural gas energy that we have, to use the renewable fuels of ethanol and soy diesel.

And there is another issue, too. We need to use atomic energy, and we have the ability today—you know, I wrote the Public Utility Act in Illinois in 1984 when 14 nuclear units were coming on line and the cost went from $400 million to $5 billion per unit. And I predicted we would never see another nuclear plant built in the country for 25 years. And, ironically, I was right.

But it is time to review this and renew it because we can have clean air with nuclear energy. But there is a problem. There is a gentleman over in the Senate that has his hand in—not a veto hand, a debate hand, a filibuster hand on the finishing of Yucca Mountain where our rate payers put $18 billion into that to make it happen.

So that is a political reality, but we need to change that. We need to find the solutions so that we can deposit nuclear waste.

I would say, Mr. Vice President, there are a lot of things that we can do. And there is a lot of potential for the future of this Nation. And I understand the problems with China and India and Mexico and Brazil and other nations that you say have low income. But you find out today that China has amassed more capital, real capital, than almost any other country over the last 5 years. That capital needs to be spent, not just on highways, but they are building those coal-fired plants. They can also be investing in new technology and new ideas, and that needs to be done, because they are building the equivalent of 500-megawatt plants of pure coal, no clean up, every week. And no matter what we do in this country—we have stopped every car, stopped every coal-fired electric plant, and we couldn't match in our drop in energy what they add in energy in pollution every year—every week.

So we have a challenge. We not only have a challenge to this country; we certainly have a global challenge. I was there in Kyoto. I watched this development. I also remember when you came in and signed the agreement and changed it a bit. The fact is, not everything has worked. And I believe in international relations. I believe that we need to have international compacts, but we also need to make sure that, when we do it, they do work.

So what I am asking and what I am saying is that I think there are answers, answers using the resources we have. I know you disagree with us on coal, but I think there are ways we could use the coal in this country. But there are some things we can do with atomic energy. There are some things that we can do with renewable fuels.

And the other part of this is we have become so dependent on foreign fuels that we are tied to sheiks and dictators and who knows what; countries like Venezuela and Saudi Arabia and Iran and Iraq and Qatar—with all due purposes—and places like Nigeria, and I can go on and on.

When somebody decides to turn the spigot off, we don't have energy. And we lose jobs. And we lose the ability to produce in this country.

I spent last weekend in Detroit, the home of our esteemed chairman, and I happened to be at the wrestling tournament, Mr. Chair-

man. I wasn't raising money in your district. I just wanted to let you know that. Maybe a little. But anyway, what I saw in a place called Dearborn, Michigan, going down the street were block after block after block of empty factories where people once worked, store after store after store closed where people used to do commerce and buy things. And as we increase regulation, we force jobs out of this country. And if we cut off CO^2 emissions and froze them today, we would have literally tens of thousands of jobs that would be moved to China and India and other places in the world, and we would lose them. We would have more empty factories. We need to work on solutions and find the legislative language and the legislative fixes that make that work.

Can you help us do that?

Mr. GORE. Congratulations on your new grandson. Is that your first grandchild?

Mr. HASTERT. First grandchild.

Mr. GORE. You are going to find grandparenting is not overrated, and it is rated pretty high. Tipper and I had a new grandson also just 2 months ago, and you are going to love it.

And it is really without being corny about it, it really is for them that we are all trying to find a way to the right solutions here.

I know that time is short so let me just be brief in response to your several comments and questions.

In your initial recitation of what you agree with, Congressman, maybe I heard you wrong, but I think you stopped short of the part of the consensus that acknowledges that human activity is the principal cause of the warming.

Mr. HASTERT. I think I said that.

Mr. GORE. I just wanted to make sure because, once that is established, then we have got a moral imperative to act here.

And then you pose the choice between taxing and investing. That may be an unfair compression of what you said, but the investments in TXU that were mentioned earlier came to naught because the investors decided that there was such unpredictability about the price of carbon that they just couldn't go forward with the plan, and so they had to completely re-jigger it.

I don't think we should raise taxes at all. I think that we should shift the burden away from working people and small business people and put it on pollution instead. And I think, if we do that, we are going to make our businesses more competitive. Some of the Rust Belt devastation that you described, some of it has been due to the fact that old inefficient polluting approaches no longer work in a competitive world economy and actually focusing on reducing the pollution turns out often to be one of the shortcuts to finding the most competitive new approaches that can restore jobs and make us more productive and more competitive in the global economy.

You mentioned nuclear. I am sure that will come up again. I am not an absolutist in being opposed to nuclear. I think it is likely to play some role. I don't think it is going to play a major role. But I think it will play some additional role, and I think the reason it is going to be limited is mainly the costs. They are so expensive, and they take so long to build, and at present, they only come in

one size: extra large. And people don't want to make that kind of investment on an uncertain market for energy demand.

Chairman DINGELL. The Chair observes that the time of the gentleman has expired.

The Chair is going to recognize next the distinguished gentleman from North Carolina, Mr. Butterfield, for 5 minutes.

Mr. BUTTERFIELD. Thank you very much, Mr. Chairman, for convening this hearing today.

You told us a few weeks ago that you were going to exert bold leadership in this area, and today is an example of your leadership. Thank you so very much.

I also want to thank the Vice President for coming forward today and thank you for your past leadership on this issue and your future leadership on this issue. Thank you very much for coming.

Mr. Vice President, as I was telling you in the ante room before we started, I will continue that now, some of my friends on the other side of the aisle make the argument that greenhouse gas emissions substantially consist of water vapors and that CO^2 is only a minute fraction of those vapors of those gasses. Would you elaborate on that and help us with it?

Mr. GORE. First of all, thank you for your service, Congressman, as vice chairman of the committee, and I appreciate your focus on this.

Water vapor is indeed the most common greenhouse gas. But there are two things about it that are really significant. Number 1, the residence time is only a few days in the atmosphere, up to 10 days, and it recycles constantly. Second and most important, it is a slave to CO^2. In other words, it goes up and down depending upon the warming that is initially driven by the CO^2. Whatever the cause is, whether it is methane in the ancient past, these long-term hundred thousand year cycles, whenever it is warmer, the water vapor increases, and it magnifies the warming phenomena. But in the time frames that we are dealing with and in the policy framework in the science that they tell us is relevant to the policy choices we have, it is completely a slave to CO^2.

So less CO^2 reduces the water vapor at the same time. It magnifies it in either direction.

Mr. BUTTERFIELD. It is clear, Mr. Vice President, from your film that you have spent a great deal of time in China. There is a perception here that China is doing nothing, absolutely nothing to control their greenhouse gas emissions. But the big four accounting firm, Ernst & Young, indicates that China is one of the top 10 countries for clean energy investment. And it is closing fast on our country.

What are the Chinese really doing to promote clean energy?

Mr. GORE. Well, they have announced grand plans, but as I said earlier, I think the proof is going to be in the pudding. There is no question that the top leadership in China is seized of this issue. They have made a bold commitment on it. The leader of China, Hu, has made several statements on it. They have made it a prominent goal in their new 5-year plan, co-equal allegedly with GDP. Wu Xintao has made two speeches in the last 10 days on this. They are deeply concerned that their coming out party at the Olympics is going to be spoiled by all of their pollution. The Yellow River often

doesn't reach the sea anymore for some months. And the melting of ice on the Tibetan Plateau has been one of the major factors in driving uncertainty about water supplies in many parts of China, principally in northern China but throughout China. They are deeply concerned about the sea level issue.

I have given my slide show multiple times in China and went to the trouble to get it all translated into Mandarin and so forth. And when I was Vice President, I gave the presentation in the Great Hall of the People.

They have scientists that are right out there on the cutting edge. And they have got national leaders who can describe the problem and tell you why it is serious. They are riding a tiger in the sense that their growth is so rapid and they are having trouble they say with their regional leaders. I think they can do this if they want to. And I think that they are preparing to initiate big policy changes.

But again, the way to improve the odds that they will get on board with this is by the United States showing leadership. Their emissions of CO^2 will likely surpass ours within the next 2 years or so. And that, again, puts the focus on the follow-on to Kyoto, which I think should be moved forward to 2010.

Mr. BUTTERFIELD. Do you agree or disagree that it is too late to prevent the carbon dioxide emissions from increasing to 450?

Mr. GORE. I do not agree that it is too late at all. And may I say, I respect those who try to set some concentration level to aim at, 450, 550, whatever, I think the present level is too high. And I think 450 would be exceedingly dangerous. I understand that we are now in a time where the maximum that is considered politically feasible now still falls short of the minimum that will really address the problem.

So our challenge is to expand the limits of what is feasible. And the good news is once we start and shift our momentum, then we will find it is a whole lot easier to do than people are saying now, and businesses already getting on board. You have an outfit like Wal-Mart, they are not doing that because they want to commit economic suicide. They are making money at it because they figured out that they can be more productive and more profitable by cutting their emissions. And I think as more businesses get with that program, we are going to find this all gets a lot easier.

Mr. BUTTERFIELD. Thank you, sir. I think we have run out of time.

Chairman DINGELL. Time of the gentleman has expired. The Chair recognizes now the distinguished gentleman from South Carolina, Mr. Inglis. The Chair inquires would the gentleman like 5 minutes or 10 minutes?

Mr. INGLIS. I would like to reclaim my time. I may not use it all.

Chairman DINGELL. The gentleman has the right.

Mr. INGLIS. Thank you, Mr. Chairman. Thank you, Mr. Gore, for being here. I am one of the people that paid for seeing The Inconvenient Truth.

Mr. GORE. Thank you.

Mr. INGLIS. And there are PowerPoints that I would have paid to get out of—a lot of them. But this is one I actually enjoyed see-

ing and it is a great work and I appreciate the work you have done there.

Mr. GORE. Thank you. Thank you very much.

Mr. INGLIS. As a conservative, I think it is important to note a couple of things. One is we really should internalize the externals. Because as a conservative, I believe in markets. And the only way a market can work is if it rightly judges the price of our product. And actually that is not just economics, that is Biblical notions, the concept that I can't do on my land something that hurts your land. I have got to keep on my land the products of my land and not harm your land. That is the basis of Biblical law. It is the basis of English common-law. It is the basis of what we have in our country now. It is a conservative concept.

Also I think we have wonderful conservative opportunities with things like net metering. What a deal if I can invest in my house and make it a profit center, recoup some of my investment in my roof by making it create electricity.

Also, I am one of these folks who believes, as a conservative, you teach your kids to do the right thing even when nobody is watching. So, yes, we have to somehow cajole China and India along. But you have to do the right thing even when no one is watching. That is what conservatives believe.

Conservatives also believe we struggle around here a lot with dynamic as opposed to static scoring. We get upset with CBO all the time for not dynamically scoring our tax bills. I think we have to dynamically score this can-do American spirit that did the Transcontinental Railroad, that finished the Panama Canal, and then went to the moon. There is a way to break our addiction to oil. There is a way to unleash the inventors and entrepreneurs of America to deliver new and better sources of energy, cellulosic ethanol, better solar cells, next generation nuclear power and hydrogen power for our cars.

So I agree with you that it doesn't necessarily have to be a lose proposition that really this can be a win proposition for the American economy.

Now, the question is, how did you get there? Because there are some scary costs that we face, and Mr. Hall has mentioned that word.

And there are trade-offs. And I have a case study to put before you. One of those CEOs that you mentioned earlier is Jim Rogers, CEO of Duke Energy.

He was in my office recently and told me of a decision he faces. It is either to build in South Carolina a nuclear plant which he would prefer to build, or a coal fired plant which he would prefer not to build. But the problem is, it is very difficult to get all the ducks in a row, if you will, for a nuclear plant, although that really would be their preference.

I wonder if you could, having established a series of agreements here if you would agree that part of the solution here is to make it possible for a Duke Energy to build that nuclear power plant, rather than to build that coal-fired plant which is 24, 7, 365 days a year going to belch out CO^2.

Is that something we can agree on to advance this nuclear option so that this real world decision right now being made within—by

the way—the next several weeks they are going to make this decision.

Signal them there can be bipartisan agreement here, that they got a future in that nuclear plant.

Mr. GORE. First of all, Congressman thank you for your statements. And I know you went down to Antarctica with former Congressman Boehlert, and I have noticed some of your statements over the last few years. And I really, I yearn for the day when there are more of you on your side—and I think the number is increasing all the time—so that we can have a really healthy debate where you all bring your core principles to the table, and the Democratic side brings their core principles to the table. And then we try to get the most effective solutions in this. I couldn't agree more.

That is what was happening in the United Kingdom, as I said earlier, that is the way we ought to be doing it. And yes, our faith traditions teach us about this and without proselytizing, all the different faith traditions teach similar things. I come out of the Judeo Christian tradition, as you do, and I am taught the Earth is the Lord's and the fullness thereof. I believe the purpose of life is to glorify God and we can't do that if we are heaping contempt on the creation. And there are multiple teachings that all point in the same direction.

Now, on conservative principles, I have always believed that one conservative principle is decentralization put more options into the hands of the individuals and the small business people. And that is one of the reasons why I think the single best thing we could do on electricity is to adopt what is called a feed and tariff system to eliminate the limits on the ability of individuals to sell decentralized electricity back into the grid and have a fair rate for it, and that will avoid the difficult choice that you say Jim Rogers is facing right now.

I think that decentralization is the wave of the future. And also on liquid fuels for road transport, by the way, and the next generation ethanol the enzymatic hydrolysis stuff that is coming on line. But on your core choice, I am not opposed to nuclear. I have deep questions about it. I am concerned about it. I used to be enthusiastic about it. Back when I represented Congressman Gordon's district, TVA had 21 nuclear power plants under construction. And then later, I had represented Oak Ridge where we were immune to the effects of nuclear radiation so I was very enthusiastic about it.

But 19 of those 21 plants were canceled. And I am sure Bart gets the same questions I used to get about whether those partly finished cooling towers might be used for a grain silo. But people are upset still that they have to pay for them and not be able to get any electricity for them.

And I think the stoppage of the nuclear industry was really less due to 3-mile island and Chernobyl and environmental concerns and more due to the fact that after the OPEC oil crisis of 1973 and 1979, the projection for electricity demand went from 7 percent annualized compounded down to 1 percent.

And when energy prices are going up, the uncertainty over how much they can plan for also goes up. Now electricity ought not fol-

low the price of oil, but it does because there is just enough fungibility between oil and coal on the margins that electricity chases oil. Now oil is back at $60 a barrel. Where is it going to be a year from now? We don't know. But the fact of the uncertainty is itself the reason why these utilities do not want to place all their chips in one large bet that doesn't mature for another 15 years at a very expensive cost. The new generation, there may be smaller incremental power plants, standardized, safer more reliable, perhaps we may get a solution to the long-term storage of waste issue. I am assuming that we will, the reactor error. But go ahead.

Mr. INGLIS. In this case, we have a real live company offering to build that nuclear plant that would produce no CO^2. It does create waste and as the speaker pointed out we need a place to put that waste and it is a problem. But comparing that to the CO^2 that is going to come out of that plant 24, 7, 365 days a year, seems to me to be a wonderful case where a company is willing to put that much capital at risk and actually help solve the problem. We, it seems to me we should help them out.

South Carolina, I understand we get 65 percent of our power from nuclear; California, I understand it is 55 percent from natural gas. I can't imagine a worse use of a natural gas resource than burning it to make electricity.

So, that being the case, shouldn't we be moving as quickly as possible—and this is not theoretical. This is a decision that could be made within the next several weeks to decide to do something that would actually reduce CO^2 levels?

Mr. GORE. Yes.

Mr. INGLIS. In the little bit of time I have left, let me ask this question. I wonder if there is a way the concern is China and India and the other countries that won't agree to anything and that has been well stated on our side. I think that is a very legitimate concern.

I wonder if you have given any thought to the possibility of some sort of a system where the developed world has an agreement that if you are going to build a plant in our areas, then you will comply with our notions of CO^2 if you build a plant in China or in India so that, in other words, in order to get a permit back here, you have to agree that there, you will abide by the rules that are going on here.

It is sort of takes it beyond the Chinese and Indians and says, we, because this is fungible air, are going to help you make this decision so that it also reduces one reason for exporting jobs, by the way, because it then becomes—I don't know if you given any thought to that kind of concept?

Mr. GORE. Yes, I have. It is very difficult to integrate the social and environmental factors into the world trading system, but I think we should do it more effectively than we have.

I think that using the market is a more effective way to do it. I am not opposed to including it in the terms of trade agreements to the extent that we can do that. But a cap in trade system that puts a price on the carbon—and you could even auction off the carbon price—that will allow the market to help you establish a price and integrate it more quickly across national boundaries so that we get the sharpest reductions globally.

Mr. INGLIS. Thanks.

Chairman DINGELL. Time of the gentleman has expired. The Chair recognizes now the distinguished gentleman from Georgia, Mr. Barrow.

Mr. BARROW. Thank you.

Mr. Vice President, thank you for being here today. As you stated a number of times today, the debate in the scientific community about whether there is a problem, whether we are behind it and whether we can do anything about it may be over. But as you can see today, the debate in the political community about a couple of core issues still goes on. We get folks who agree with the idea that there is some change, but they will quibble with whether or not we are the cause of it. They will agree that there is a climate change going on, but they will quibble with the question of whether or not we can do anything about it.

And just in the hearings we have had, I detected something of a pattern on this subject. We opened up with a hearing with the representatives of the scientific community who came before us and said in no uncertain terms there is a problem. We are behind it. And we have to do something about it. Then we had a series of hearings with what I might call the impact community or the solution community, a series of hearings where we are consulting with various sectors of the economy to go over with them the impacts of various solutions are and what they are doing about it; the automobile industry, the utility company, the private sector, the automobile industry. We have a series of—in fact, this is about eighth hearing that I can remember we have had so far on this subject.

And in the course of these hearings, in the course of them, I detected sort of a pattern that has emerged. When the experts on the problem were here, there wasn't much going on. There wasn't much back and forth on the subject of whether there was a problem or not. But when we get into the solution hearings and impact hearings, we get a lot of folks pooh-poohing or putting down the issue and raising questions, some of which we have heard today.

One of the questions I want to follow up on is sort of like a follow-up on what Congressman Butterfield was asking earlier. He asked about the question about the relationship between water vapor as a greenhouse gas and carbon dioxide as a greenhouse gas. I want to follow up on similar statements that have been made, because just recently—well, earlier in this series of hearings in March, March 7, there was a statement made by one of the members of this committee to the effect that natural emissions overwhelm manmade emissions.

> The ratio of emissions of greenhouse gases that are natural to those that are manmade is so overwhelming that it calls into question or casts doubt on whether or not we are actually responsible for any part of the problem or can do anything about it.

What do you say to folks who argue that there really isn't a problem or it is a problem we haven't got our fingerprints on or can't do nothing about? What do you say to folks who argue that natural emissions are overwhelming manmade emissions in this scenario?

Mr. GORE. Well, Congressman, first of all, thank you for the time you put in delving into this issue. We have known each other almost 20 years now, and I appreciate your service very much.

Each one of these CO^2 molecules has a kind of a chemical signature. And they can determine with a very high degree of accuracy that the extra amount that has been added to the atmosphere in the last 100, 150 years, since the beginning of the industrial revolution—but really in this past century are manmade.

Now, sometimes you will hear about the vast volumes of emissions that come from volcanoes for example. Here is what the scientists say is the difference there. They are heavy particulates and they fall out of, back to the ground over a period of a year and a half or so. And for that brief period of time they can have an impact. Mount Pinatubo had an impact. Way back in 1815, I guess it was, we had a year without a summer because of a huge volcano in Indonesia.

And one of the ways they have improved their understanding of the whole science of global warming is by studying these natural emissions. But most of them have the short residence times, short life times in the atmosphere.

What the problem is is CO^2. Now, methane is also a problem. Nitrous oxide is a problem. But the vast majority of the problem is CO^2—70 million tons every single day that we are putting up there. And it stays there for so long—as I mentioned earlier, it takes 100 years for half of it to come back out. So it is the old saying a journey of a thousand miles starts with a single step. We have got to take a lot of steps. And we have to do it quickly. It is not the natural emissions that is causing this. We are overwhelming the natural cycles.

Mr. BARROW. Thank you, Mr. Vice President. I am running out of time, Mr. Chairman, so I yield back the balance. Thank you.

Chairman DINGELL. Chair thanks the gentleman. The Chair observes that the next of our colleagues to be recognized is Mr. Upton of Michigan for 5 minutes.

Mr. UPTON. Well, thank you, Mr. Chairman, and Mr. Vice President, we welcome you today and we appreciated your testimony. I want to say that as you ticked off a number of different recommendations, I think that there are a good number of them that many of us can support. And I would note that in a hearing in the last couple of weeks, my chairman, Mr. Boucher, said this, any bill which we would support must have bipartisan support and industry support. It must be an economywide, not restricted to just certain economic sectors. It should be capable of passage not just in the House, but in the Senate as well.

And we take that as a good challenge and we intend to work on a bipartisan basis to see that.

Some of the things specifically that I appreciated in your comments were these, obviously, a move toward clean coal technology, something that we have started and we need to finish. We do need to use the Tax Code in a number of different ways.

For me, coming from Michigan where we have the highest unemployment rate in the Nation, jobs are certainly a big issue. And I want to help the auto industry. And I must say that I am co-chair of the auto caucus with my colleague Dale Kildee, the second largest bipartisan caucus in the Congress.

What we are seeking is not unfunded mandates but actually to try and help the auto industry and therefore the consumers indeed get better mileage and fuel economy standards with their vehicles.

Wind and electricity, obviously, those are issues that we all need to move forward on. And I want to commend Ms. Harman and Mr. Hastert and Mr. Boucher and myself, a number of us are looking at technology for light bulbs to see a real change where we can see true savings in that. And I would just note take in the bipartisan energy bill that passed, the President signed in 2005, Mr. Markey and I had a provision on daylight savings time that as we learned for every day that we extended day light savings time we saved an average of 100,000 barrels of oil energy equivalent.

As it turned out, a nonprofit study came out and it indicated that we would, by the 4-week extension of daylight savings time, emit 11 million metric tons less of carbon between now and 2020.

But the questions that I have for you—and I really saw it missing in the debate as it related not only to your book but also in the movie, you have touched on it briefly here—was the whole issue of nuclear energy.

And now, Mr. Markey and I might agree on daylight savings time and a few other things. But we disagreed strongly on Yucca Mountain. And it was my bill along with Mr. Hastert and Mr. Barton and Mr. Dingell that we are truly helpful to begin to try and see the funding for Yucca Mountain. And I remember that it was your old boss, Mr. Clinton, who on a campaign stop back in the 1990's, indicated to the voters in Nevada, that if he was elected President, he would veto that bill. And I think that is, in essence, what happened. We had to run over him to get where we were.

And you were quoted not too long ago, at least according to the Nuclear Energy Information Resource Center, is "I do not support any increased reliance on nuclear energy; moreover, I have disagreed with those who have classified nuclear energy as clean or renewable."

Today we are seeing a new, new-coal fired plant being built in China almost every 4 days, literally, 2 every week. Many of these as I am told don't have scrubbers. And as you talk about the big dog in this fight, the nuclear industry—and I know that France is about, I think 90 percent reliant on nuclear energy, and this country we are about 20 percent.

Right now there are about 24, 25 different nuclear plants being promoted around the world—none of them in the United States. And I am glad to hear my friend, Mr. Inglis, talk a little bit about Duke Power down in South Carolina, because I am a supporter of nuclear energy. And I do think that can be an enormous asset for this country and the consumers. I am one that believes that the energy cost of $60 dollars a barrel they aren't going to stay there. They are only going to go up. And so as we look at a relationship between the cost of energy and where we are nuclear, I think that this is one of the savings that we can have. And I would hope that because this was missing in the debate, in your book and the movie, that perhaps in light of today's hearings, perhaps you will have a little change of mind, and I yield my 18 seconds back for you to respond.

Mr. GORE. I don't recognize the quote that you used as one of mine. I am not saying it wasn't, but I don't really agree with the way that was phrased.

I am not a reflexive opponent of nuclear power, Congressman. I am just a skeptic about nuclear power's viability in the marketplace. I think that if we let the market allow the most competitive forms to surface, what we will see is decentralized generation, widely distributed, we will see an emphasis on conservation and efficiency and renewable energy. But where nuclear power is concerned I have expressed my views, previously, I am not a reflexive opponent, I think there will be some new nuclear power plants.

But you mention China. Look at their 5-year plan right now. You are right, they plan 55 new coal fired power plants per year. Only three nuclear plants per year. Now why? They don't have any opposition that they can't overcome pretty easily from Beijing. But they see the same problems just in practical terms that a lot of our utilities see. These things are expensive and complicated. They take a long time and the fragility of the operating regime has already been seen. I have been to Chernobyl. I have been to Three Mile Island and I don't want to exaggerate those problems.

I think that we can come up with solutions for the dangers of operator error. I think we can come up with solutions for long term storage of waste. I don't think Yucca Mountain is it. And I think if you don't skate past the real scientific evidence of what they found at Yucca Mountain. What they found on the geology there makes it simply wrong to put stuff that is going to need to be contained for tens of thousands of years in a place that is really not appropriate for it. Now that is my reading of what the geological survey has said about that. But I am not opposed to it as a category.

Chairman DINGELL. Chair recognizes now the distinguished gentleman from California, Mr. Waxman, for 5 minutes.

Mr. WAXMAN. Thank you very much, Mr. Chairman. Mr. Vice President, it is a pleasure to see you. And I want to commend you for the enormous leadership role you are playing on educating the American people and today educating the Congress about the greatest threat to our planet. It is a threat not only because of the environmental problem, but it is a threat as well to our national security because burning of fossil fuels makes us more and more dependent on unstable sources of petroleum from the Middle East.

When we look at this issue, it seems to me when we talk about market forces. If government did nothing, there is no reason why any business would want to spend the money to reduce emissions unless they knew that every one of their competitors had to do it. So when we hear about market forces, but don't put any requirements on industries, that just won't work because then the incentives are to pollute more because you don't want to be at a competitive disadvantage.

When we put something in place to deal with this problem, it strikes me that what we need to do is to look for renewable energy, to look to alternative energy and greater energy efficiency.

I introduced a bill yesterday, the Safe Climate Act, and we tried to use this comprehensive approach of looking at all these areas. But we tried to use market systems as well in order to drive the

technology. The market systems would be a cap and trade, but the levels that we have called for reductions in our pollution would be to get to 1990 levels by 2020 and 80 percent below that by 2050.

I would like to know whether you think these kinds of reductions are the kinds of reductions that the scientists are calling for? A lot of people want to do less because they think it is more politically palatable. But if we are going to deal with this problem, let's follow the science, in my view, and get to the reductions we need. Do you think these are realistic and important levels for reduction?

Mr. GORE. I really do, Congressman Waxman. And I commend you on your legislation. I saw it yesterday. And I don't feel that I have the expertise to get into every part of all the different the bills that have been introduced, but I sure do like your legislation a lot. And I think the level of reductions that you are calling for are in keeping with what the scientists would want us to do.

And some of them would want us to do even more. As I said earlier, I think that the current levels of 383 parts per million are already dangerously high.

I mean, if we see that the disappearance of the Arctic ice cap in the next few decades, that would be a radically dangerous change for our planet. A few years from now, we are going to be back here or will be in conversations, all of us, about this, and the world is going to look so different.

The range of things we are talking about now are just going to seem so small compared to what people are going to be demanding then. I am telling you the awareness on this is just on a straight upwards trajectory. And it is not partisan. It is not partisan. This is not a political issue. It is a moral issue.

And our children are going to be demanding this.

Now, so in terms of your legislation, I think you have done a great thing there. And I think it is related to the energy security crisis. We are at a carbon crisis. We are borrowing all this money from China and buying all this oil from unstable places and burning it in ways that are destroying the habitability of the planet. That whole pattern has to change.

Mr. WAXMAN. Mr. Vice President, we on this committee have fought conventional air pollution in the Clean Air Act and we had a strong Clean Air Act, good legislation, consensus legislation that we adopted in 1990. But conventional air pollution can also contribute to global warming. Shouldn't we work to address conventional pollutants like black carbon even while we press forward on reducing carbon dioxide emissions?

Mr. GORE. Absolutely, and the so-called four pollutant standard, or "four P" approach is, I think, the most efficient for utilities, most efficient for industry. If they are going to retrofit—and of course, if they are going to expand, the law requires them to upgrade—they should be doing all four of them at the same time. I agree with you totally.

Mr. WAXMAN. I hear a lot from people who express hesitancy about this issue. They say it is going to destroy our economy. Well, that smacks of fear. And fear can be very paralyzing. I also hear people say, well, they have a magic solution: nuclear power. I think your approach is a smart one. It is a business-like approach. Nuclear power is an option. You don't want to rule it out but it is cer-

tainly no magic solution. It almost becomes a theological expression whenever I hear a discussion of these environmental issues. My view—and I think it is what I hear you saying as well—let's unleash the ingenuity of the marketplace, give people the incentives to do the right thing, and then just watch out because people are going to develop technology that we don't even know about today that will help us deal with this problem.

But if we don't put something in place to insist on those reductions, we jeopardize our planet. And some people have told us we only have a small window of opportunity to act. I thank you for your leadership on this issue.

Mr. GORE. Thank you for your leadership Congressman.

Chairman DINGELL. Time of the gentleman has expired. The Chair recognizes now the distinguished gentleman from Maryland, Mr. Bartlett for 5 minutes.

Mr. BARTLETT. Thank you very much. Mr. Vice President, my wife notes that she thinks there ought to be some relationship between conservative and conservation.

And indeed, I think it is probably possible to be a conservative without appearing to be an idiot.

Mr. Vice President, there are several groups that have common cause with you in wanting to reduce CO^2 levels, CO^2 production through conservation, through efficiency and through more use of renewables. These include those who are concerned with national security, the fact that we have only 2 percent of the world's oil, use 25 percent of the world's oil, importing almost two-thirds of what we use. Those that are concerned that fossil fuels are not infinite, that we have probably reached about the midpoint of oil, which is about peak oil, that it is going to be downhill after this, those who are concerned about a challenge for increased economic development, more manufacturing export, which certainly could come from a focus on moving to renewable and the general environmentalist who understands that when you produce CO^2, you also produce other pollutants, and isn't the air polluted enough, thank you.

We don't have to agree with the premise of these other groups, but I am a member of each of those groups, I would like to note, to embrace a common solution.

And my question is, how can we get together to combine our forces?

The second question I want to ask stems from a trip that I just took to China. I led a delegation of eight other Members to China. And we went to talk to them about energy. And I was stunned they began their conversation by talking about post oil. And they have a five-point plan, the first of which is conservation; second and third, diversify your energy sources, get as much as you can from your own country; and fourth, be kind to the environment, to the planet. They know their awful polluters. They are asking for help.

And the fifth one is international cooperation. They recognize we need international cooperation. And indeed, whichever one of these camps you belong to global warming or national security or peak oil, it is going to require international cooperation.

My second question is, are we adequately reaching out to China and these other countries?

Mr. GORE. I don't think we are. I think that the group that was put together with U.S. and China and Australia and a couple other countries has been unfortunately just an opportunity to talk and not really do anything. In order to have success with them, I think that we do need to take action ourselves, and I think that there are aspects of this challenge beyond CO^2 involving methane and land cover, for example, that may offer some interesting possibilities for getting them to join earlier rather than later.

And of course, they bridge the categories. They are still a developing country, but they are the Saudi Arabia of manufacturing now. And their emissions will, before too long, be more than ours. So we have got to find a way to get them involved. But it is a negotiation.

Now, if they are the outlier, and if the rest of the world is acting, I don't think there is any doubt that they will join. I really think that that is the best way to get them on board.

But we don't have an option of just forcing them to do it.

I wanted to say, Congressman, that I have followed some of your comments over the last several years, and you heard me quote one of your comments in my opening statement. I do think that one of the keys to getting a true bipartisan dialog here is by focusing early on one of the realizations that you expressed early on, that there are some places where the market is currently failing to internalize enough of the cost to give us an accurate picture of what the choices are. And if the decision to pollute is free, and you can dump as much of your pollution as you want on to everybody else, then the actual cost there are misleading you because you are seeing them as free. They are really not free.

And the way to get our businesses—to give them a better chance to really compete effectively is to internalize those costs so that they can make more accurate calculations and get with the program. As soon as carbon has a price, you are going to do a wave of investment that just will boggle the mind.

Just last week, Morgan Stanley executed the first trade in the marketplace for carbon emissions post 2012, no legal regime out there. The market is seeking to put a price on carbon. And I think if this Congress can help them do so, that is one of the real keys to unleashing this investment.

Mr. BARTLETT. Thank you very much, Mr. Chairman. I yield back.

Chairman DINGELL. Time of the gentlemen has expired. The Chair recognizes now the distinguished gentleman from Massachusetts, Mr. Markey.

Mr. MARKEY. Thank you, Mr. Chairman, very much and welcome back, Al.

You and I were elected 30 years ago and sat down on this bottom row. It seems like yesterday, but——

Mr. GORE. You had 3-week seniority on me.

Mr. MARKEY. You never forgot that or forgave me the 3 weeks of seniority.

But back then, Congress had just passed a new law, which mandated the doubling of the fuel economy standards for the automotive fleet in the United States from 13½ miles per gallon to 27

miles per gallon. Over the next 10 years, American dependence upon imported oil dropped from 46 percent to 27 percent by 1986.

We had made a dramatic change in our relationship with imported oil.

But that number has stagnated since then and actually declined, even as other countries had increased their fuel economy standard requirements.

So as part of this discussion—and I know it is in your book, and you have referred to it in your testimony—there is a conclusion reached by the National Academy of Sciences in 2002 that using existing automotive technologies, not including hybrid technology, that we can improve our fuel economy standard to 35 miles per gallon over a 10-year period, and in that period of time back out all the Persian Gulf oil, and as a result, reduce carbon emissions the equivalent of about 170 coal-fired plants per year.

Could you talk about that issue and the centrality of our need to improve dramatically the fuel economy standards for our vehicles?

Mr. GORE. Well, I support your legislation, Congressman, and I congratulate you on your new select committee, and in any way I can help you, I want to and we have been friends and allies on so many things for all these years now, and I am really excited about your leadership on this issue.

I mentioned earlier that in addition to supporting your bill, I also support the general idea that your legislation should be part of a comprehensive package. And my fondest dream is that this Congress will come up with a series of initiatives that, taken together, constitute a really bold step in helping us sharply reduce CO^2 emissions.

And I think it is easy to see how Congressman Dingell would be concerned as anyone would representing an area where there is a concentration of a very important legacy industry and future industry in our country if it seems like that is being singled out. And so I respectfully suggest that we ought to—I encourage the passage of your legislation and as part of the comprehensive package and the cap-and-trade system, could lead to some very interesting bargains between the fuel suppliers and the industries that make cars and other things that burn the fuel and find the most efficient ways to get the reductions.

Now, let me say something controversial. I don't think it is controversial but I know it is not necessarily welcome. I really believe that the old saying—and I will say this to you, Congressman Inglis, be careful what you pray for. I think it would be amended be careful for what you lobby for. Because successful lobbying for the lowest of auto efficiency standards has not been good for our automobile industry. And we all know that the less efficient vehicles that cost more money to operate when the price of oil goes up—which was not completely unpredictable by the way—are a hard sell now. And the companies that are doing better are ones that have more efficient vehicles.

And it is a complicated story. We need to solve it. We need national health care, and you get that off the backs of the auto companies as well and it is all interconnected, but efficiency goes hand

in hand with marketability in this new age that is rushing toward us here.

Mr. MARKEY. Well, I want to say I thank you, very much, that I obviously sat here with you 30 years ago and what you are saying about information technologies, what you were saying about environmental issues back then, now retrospectively really do make you look like a prophet. You had your finger on the pulse of the issues of the 21st century, and that is the reason you are here today. And I think that it would be wise for the Congress to listen to your warnings, because I think that history has now borne you out. Thank you for being here.

Chairman DINGELL. The time of the gentleman has expired.

Mr. GORE. I appreciate your kind words.

Chairman DINGELL. Chair recognizes now the distinguished gentleman from Kentucky, Mr. Whitfield, for 5 minutes.

Mr. WHITFIELD. Thank you, Mr. Chairman, and Mr. Vice President, we are delighted you are here today and we certainly appreciate the time that you are spending with this joint committee. You would be the last person I think that I would probably have to say that we all recognize that we live in a pretty polarizing country today.

Chairman DINGELL. Would the gentleman yield?

Mr. WHITFIELD. Yes, sir.

Chairman DINGELL. Just for a housekeeping matter here I apologize. I will not take it out of the gentleman's time. We are going to have a vote in about 5 minutes or so on the House floor. And our distinguished witness has informed us that he has to be elsewhere and so the gentleman from Kentucky will be the last member of the committee that will be recognized for purposes of the questions. And then the Chair would observe that we will after that adjourn, go over to the House floor and vote. And we will return to hear our next witness. I hope that our members will come back, because the Chair wants to have both a complete record, full participation of the members, and very frankly, an opportunity for all members to appreciate the seriousness of the matters before us. So, the gentleman from Kentucky is now recognized.

Mr. WHITFIELD. Thank you, Mr. Chairman, and Mr. Vice President, this is one of those issues that certainly there is a lot of division on. I think everyone recognizes as you have said, and the scientific community agrees, that there is global warming caused by human activity.

But I was reading a statement that either you made or was a part of your movie, "An Inconvenient Truth", and it said we have just 10 years to avert a major catastrophe that could send our entire planet into a tailspin of epic destruction involving extreme weather, floods, droughts, epidemics and killer heat waves beyond anything we have ever experienced.

And those kinds of statements—I think one of the attributes that you have is that you are very passionate about these issues. And that is one of the things that attracts people to you, that passion. But at the same time, and I am not quoting these for their truthfulness, but simply to say these are some statements that we read in recent articles about these kind of statements.

It says, this is overstating our certainty about knowing the future.

We agree on fundamentals that warming is real, but we do not agree on the urgency or the consequences of that. And then one scientist was quoted as saying that this is shrill alarmism. And then Mr. Lomborg is to be testifying later today after we vote. And he brought a group of imminent economists to Copenhagen and they looked at major issues facing humanity today. And the point was that the world's financial resources is limited. And so, how should we spend these resources to the most effective use and help of humankind today?

And they listed 17 issues that face mankind today, like disease, and malaria and HIV and water safety, water sanitation issues, education, whatever, whatever, and climate change came down as the very last issue that should be addressed.

And so, I guess the comment that I would make, I think everyone agrees that we do have global warming. But then the question becomes, what is the urgency of it? What is the consequence of it? And when you have people coming from diametrically opposed positions, what advice would you give us in to trying to address this and spending these limited resources?

Mr. GORE. Well, thank you very much, Congressman. Again, the initial quote that you attributed to me, I don't recognize those words. I have said things similar to that but I have tried to say it more carefully and in different ways. Let me tell you exactly what I do believe. And it is not coming from my analysis of the science. It is coming from those scientists whose judgment I most respect on this.

Way back, I used to hear people say we only have 10 years, this kind of thing. And I never endorsed that. I never endorsed it. First time I made a statement similar to that was less than 1 year ago, and I will tell you why. The scientist I most respect, including Jim Hansen, who runs the most sophisticated modeling program for NASA and others, have now, have recently come on the conclusion, within the last year, that the evidence now does show that we may have as little as 10 years within which to begin making dramatic changes, lest this problem gains so much momentum, our ability to forestall it will be lost to us.

Now let me tell you what they are referring to.

A couple of theories. Arctic ice cap, Greenland, west Antarctica, the frozen methane and frozen carbon and other forms not only in Siberia and Alaska, but also in the shallow seas where they have these formations that they have now seen are vulnerable to melting and releasing huge amounts of methane.

Let me take them one by one. First of all, the Arctic ice cap—it is a floating ice cap. And it is only 6 to 8 feet thick on average. Captain William Anderson just died a couple of weeks ago. He was a Member of this House of Representatives. He was the captain of the *Nautilus* and made the first voyage to the North Pole in a nuclear submarine in 1958. For almost 50 years, they have kept a record of that thickness. Finally they declassified it in ways that could make it usable to the scientists.

Those and other data series now make it clear that this floating ice is melting very rapidly. Ninety percent of the incoming solar ra-

diation that hits that ice cap now bounces off. It only hits up there 6 months of the year. But in our summer it bounces off. It is one of the ways our planet cools itself. If it melts—as it is melting—the open ocean absorbs 80 percent. So that is a big change. That is not just a gradual change. That is a big change. That is already why the temperatures in the Arctic are increasing more than twice as fast as anywhere else in the world outside the Antarctic Peninsula.

If it goes completely, if it just goes to the seasonal ice which is just 1 or 2 feet thick, then it will be gone. And that will be become one of the biggest heat sinks on the planet. And if that happens, our ability to retrieve this favorable climate balance that we have developed then as a species, would be potentially lost to us.

Now, if the Arctic ocean starts heating up radically that puts more pressure on Greenland. There is an amount of ice on Greenland that you know is 7 to 8,000 feet thick, a huge ice dome. It is equal to 6- to 7-meter increase in sea level worldwide. In the past, it has broken up in some of these ancient eras. And it has raised sea level that much. If Greenland goes, then again our ability to retrieve this problem might be lost to us.

West Antarctica, same thing, more stable than Greenland, they believe but they, the science magazine article just came out 3 days ago shows—and I recommend it to the committee. I will provide it along with my testimony—it shows exactly why these ice sheets are moving far more rapidly than anybody predicted. It has really shocked the scientists. And if that goes, that is another 6 to 7 meters.

Now, then the frozen methane and other forms of carbon in the tundra and the shallow seas. There have been tipping points in the ancient past where temperatures reached the point where that is suddenly—that is released. Methane is 22, 23 times as powerful a greenhouse gas, as CO^2. If we don't stop turning the thermostat up before we cross that tipping point, that is another reason why these scientists are saying, we have a short time frame in which to act.

And I hear the bells. Mr. Chairman, if I may, briefly conclude by expressing my deep thanks, to you, to Chairman Gordon, to your ranking members, to the other subcommittee chairs and ranking members, and to each member of this committee my apologies to the extent that I may have contributed to the longevity of this dialog at the expense of your time, I am very grateful for the honor of being here and participating in this dialog and I wish you well in the crucial legislative tasks you have before you.

Chairman DINGELL. Well, Mr. Vice President, we thank you for your kindness to us, the Chair recognizes, first, the gentleman from Texas, Mr. Barton.

Mr. BARTON. We thank you Mr. Vice President, and we look forward to continuing the dialog. We appreciate your sincerity on this issue.

Chairman DINGELL. I am delighted that you are back here, we remember you with great affection and respect for your time and on this committee.

Mr. GORE. I learned about another new rule from you just this morning, Mr. Chairman. Every time I come here, I am freshly educated about the rules of this committee.

Chairman DINGELL. They are the only defense that the Chair has. The Chair recognizes now our distinguished friend from Tennessee, Mr. Gordon.

Chairman GORDON. Mr. Vice President, on behalf of your old Science and Technology Committee, Energy and Commerce Committee, this is really unprecedented as well as on behalf of the whole United States Congress, as well as your new grandson Oscar, we thank you for your testimony.

Mr. GORE. Tell Peggy happy birthday.

Chairman DINGELL. Thank you, Mr. Vice President. And it is a pleasure to see you, Mrs. Gore, too. Thank you for being with us.

Mr. BARTON. Mr. Chairman, will we reconvene immediately for votes?

Chairman DINGELL. The Chair is going the ask for order because there is an announcement here. The Chair is going to announce there is a vote on the floor at this time. It will be followed by a number of other votes, the Chair is advised.

We will therefore return—I am not quite sure exactly when that will be, but 15 minutes after the last vote has been concluded. At that time we will hear from a distinguished witness suggested by the minority, Dr. Bjorn Lomborg, from Copenhagen Consensus Center, and we will look forward to hearing your testimony sir.

Th committee stands in recess then, until 15 minutes after the last vote.

[Recess.]

Mr. INSLEE [presiding]. The committee will be in order. We have before us Professor Bjorn Lomborg who is the adjunct professor at Copenhagen Consensus Center at the Copenhagen Business School. Professor Lomborg is author of "The Skeptical Environmentalist", great title, and Professor Lomborg, we would like to hear your comments for as much as time you as you like within reason. Thank you.

STATEMENT OF BJORN LOMBORG, ADJUNCT PROFESSOR, COPENHAGEN CONSENSUS CENTER, COPENHAGEN BUSINESS SCHOOL

Mr. LOMBORG. Thank you very much Mr. Chairman, thank you members. I am very happy to be here and I think it is a very important issue that we are discussing. Obviously I would like to go through—and I have a PowerPoint up here, I hope everyone can see it.

I think it is important to say climate is back on the agenda and I think we should recognize that that is still to a large degree thanks to my co-presenter, Mr. Al Gore. The climate discussion was strong back in 1992 when it was put on the agenda by Earth Summit in Rio. It was also strong when we talked about the Kyoto Protocol in 1997. And to a large extent, Mr. Gore deserves applause for making global warming cool again.

However in this presentation I will move beyond recognizing the importance of global warming and ask, how we should deal with it, how we should view it, and how we should put it in perspective? And so I will make four basic points which will come up in the next slide.

First, global warming is real and manmade. I think that point is best made by the U.N. Climate Panel, the so-called IPPC, latest in its 2007 edition, as Mr. Al Gore also pointed out.

Second, the consequences of statements about strong, ominous, and immediate consequences of global warming are often wildly exaggerated, as I will also be showing you later on.

The third point is we need smarter solutions that basically, yes, we need to focus on solutions, but very often those proposed are excessive; even if they are well intentioned, they are actually going to cost a lot and do fairly little good.

And that leads me to the fourth and final point that climate change is really not the only issue. We need to listen, as this hearing asks to make a global perspective on global warming and say climate change is not the only issue on the agenda. There are many other issues and we need to ask, where we can do the most good first?

And so I think it is important to say, if I should sum up what I am going to be saying here, we need to be frank. Al Gore and the many people he has inspired have goodwill and great intentions. However, he has got carried away and has come to show only worst-case scenarios and I think we need to recognize that. This is unlikely to form the basis of good judgment. The problem is compounded in that if we follow Al Gore's recommendations, we will likely end up choosing very bad policies to solve the many problems that we agree need to be addressed. In short, Mr. Gore's logic, with all its good intentions and sincerity, would in effect present an obstacle to saving millions of lives.

But I think it is also an opportunity. This very debate is a remarkable occasion to recapture our goodwill, as Al Gore talked about earlier. It is a chance to recap our policies. It is an opportunity, I would argue, for America to reclaim its leadership, both enacting sensible global warming policies and smartly addressing the many other ills of the world. And so I would like to focus, instead of rhetoric, actually try to present you with some of the important facts I think are important to have this conversation.

The first point—and I am simply going to go through these four issues I pointed out—is that that global warming is real and it is manmade. It is on the agenda, thanks to Al Gore, and I think we need to make sure to thank him for that.

The best information comes from the U.N. Climate Panel. The likely temperature rise by 2100 is going to be about 5 degrees Fahrenheit. The total cost of global warming is about $15 trillion. That is a remarkable sum of money. We should be realizing that, of course, and we ought to make it clear that we need to be sure we do the right thing about this.

On the other hand you also need to put in perspective the total net worth of the 21st century is about $3,000 trillion. So it is about 0.5 percent of the total cost, and that puts it into perspective. We need to take this seriously. We always need to have smart policies.

The second policy—and I would like to dwell a little bit on this—is the consequences are often vastly exaggerated. And that leads, I would argue, to bad judgments as to what we actually focus on.

If I could first look at the sort of Al Gore standard story. There was actually a gentleman here earlier that read out this quote, and

Gore couldn't quite recognize it. But I can assure you it is at least correct—it comes from his Web site for the movie where he talks about a planetary emergency. "We have just 10 years to avert a major catastrophe that could send our entire planet into a tail spin of epic destruction involving extreme weather, floods, droughts, epidemics, killer heat waves, beyond anything we have ever experienced."

Obviously there are many, many more of these kinds of statements. I would like to take you through four of these issues: heat deaths, sea level rise, hurricanes and malaria.

Look at the first one. If you talk about heat deaths, it is absolutely true that with global warming we will see more heat deaths. We will basically have an increase in heat deaths. If you look at the U.K. where we have some of the best estimates, for 2080 we will probably see about 2,000 more heat deaths. That is definitely something we should know. However, we should also realize that global warming will mean fewer cold deaths. And we need to be able to say both of these—for Britain it is estimated the fewer cold deaths will run into about 20,000 fewer cold deaths. We need to have both the pieces of information. It is unlikely we will make good judgments if we don't.

If we look at the numbers from the U.S., which is the newest numbers we have from a global survey in 2006, peer reviewed, as for the U.S. there will probably be about 174,000 net fewer cold deaths and heat deaths in the United States. We need to have this information. It doesn't mean that there are no problems with climate change. But it does mean if we only focus on one part of that argument, we are likely to make bad judgments.

Likewise, if we look sea levels rise, sea levels will rise; that is absolutely true. But it is not going to be a catastrophe. The U.N. Climate Panel estimates that it is probably going to be about 30 centimeters, or 1-foot, over the next 100 years in the standard scenario A–1 B. It is not going to be Al Gore's 20 feet. And, again, it is important to say 1-foot is something we can deal with; 20 feet would undoubtedly would be very, very hard to deal with.

Of course we need to realize we also saw 1-foot of sea level rise over last 150 years. Now, was that a big problem? It was certainly something we dealt with. The thing I like to imagine is if we ask an old survivor from the last century, probably an old woman, what she remembers of the last 100 years, she is likely to talk about the two world wars, the Great Depression, maybe the invention of the internal combustion engine, maybe even the IT revolution, but it is unlikely she will say, oh, and the sea levels rose simply because we dealt with these issues. So we need to get a sense of proportion. This is a problem, but it is not the end of civilization.

If I could just show you, this is the difference between what the U.N. Climate Panel is telling us will happen with Greenland, which is essentially 1.4 inches, and Gore's predicted 20 feet. I think making that kind of misrepresentation of the data is just simply not helpful.

Now, notice again I am not saying that Al Gore has not been good on putting global warming on the agenda; but I am saying it is unlikely by exaggerating the events of global warming to this point is going to help us. It is unlikely that it will.

If I could take a look at the next slide, hurricanes, it has been pointed out by many that we will see ever more damage costs from hurricanes. This is actually the statistics for the U.S. for the last 105 years, the damage cost. And what you can clearly see is basically just 2005 outweighing virtually anything else. Of course it is especially Katrina, but also several others. You can also see 1992 Hurricane Andrew. Again, this seems to indicate the very dramatic rise in the cost and seems to enforce there is really something going on; maybe this is due to global warming.

But, of course, you actually have to realize that it is predominantly because we have many more people living much closer to where harm's way is, and with much more good.

If you actually recreated—and this is what researchers did—you can see the result up here. If you imagine all hurricanes from the last 105 years hitting the U.S. as it looked in 2007, you see this graph instead. You actually see the highest cost of hurricane as the great Miami storm in 1926. Of course back then, it just basically hit a lot of sheds—not entirely—but it only cost about $700 million. Had it hit today, it would probably have cost more than Katrina and dramatically more, probably about twice as much as what Hurricane Katrina did. And what this really shows is that it is something entirely different that is driving the increase in cost.

If I could have the next slide, please. It is basically social vulnerability. Just imagine you know the population of just Dade and Broward today in Florida is a similar number of people as the entire gulf and Atlantic coast of the U.S. in 1930. So, obviously, we will see much more damage today than we would see back then.

So if you actually ask the researchers, how much can we do if we do something about climate change, the answer is over the next 50 years if we could stop climate change—which of course we cannot—but even if we could, we would probably prevent 10 percent of the damage increase; whereas if we could end social vulnerability, which of course we can't either—but we can prevent part of it—we could probably prevent about 480 percent of the damage increase.

So the simple question here is if we really care about trying to make people less vulnerable, if we want to have them less hit by hurricanes into the future, should we be focusing on the 10 percent up there or should we be focusing on the 480 percent? And, perhaps more importantly, the 480 is going to be fairly cheap, whereas the 10 percent is going to be very, very expensive.

So, again, this is a question about taking the rhetoric down and letting us have the conversation of where can we do the most good.

The last thing I want to show you is malaria. Al Gore also focuses on malaria. A lot of people actually talk about malaria and say that with more heat we will see more malaria. That is also weakly true because it is weakly related to increasing temperatures. On the other hand it is much, much more dependent on wealth and treatment. If you look at we had malaria endemic both in Europe and the United States during the Little Ice Age. We had malaria in the Arctic Circle, and even malaria in Moscow in the 1940's. Italy wasn't clear from malaria until the 1970's.

Essentially, if you get rich you deal with malaria. If you get a well-functioning health system, you deal with malaria.

And so the question is, again, are we turning the right knob if we are worried about climate change?

And let me show the next slide, if you look at how much Kyoto can do and how much a targeted malaria policy can do over the next century. The basic point is if we do something about malaria for about $3 billion a year, we could probably avoid about 28 billion cases of malaria over the next century. If we do it through Kyoto, which is probably going to cost 60 times as much, we will end up doing 400 times as little.

And so the question here is not to say, yes, climate change is true; yes, in a perfect world we would also want to deal with climate change. But we have to ask ourselves do we want to be remembered as the generation who did a lot for a little money, or do we want to be remembered as the generation who did a little for a lot of money? When I present it like that it is obviously not such a hard question.

But let's go through and look at some more of these issues. I just wanted to show you one thing. This is the cover of Science News from 1975. Back then we were worried about global cooling. It is not to say we are not much smarter now. But it is to say, look at how we always hear the worst case of whatever it is that we are worried about. Back then we worried enormously about global cooling. You can actually see New York there, being flooded over by a glacier. I am sure that is actually going to go very slowly. But still, what you see there is basically they told us all the worst things that they could from global cooling.

But it is curious if you think about it, if we worry about temperatures rising and saying that is going to mean more malaria, how come when we worried about global cooling nobody said, but at least it is going to mean less malaria. We never seem to see the other other side of the argument. I am not saying that overall global warming is not going to be bad. I am saying it is unlikely we will make good judgments if we don't see both sides of the argument and if we don't get a sense of proportion.

That brings me to the third point; namely, that we need smarter solutions. The ones we have proffered right now are just simply very costly and not going to do very much good.

Let me briefly show you if we do Kyoto—this is perfectly standard analysis—the cost of Kyoto is about $180 billion a year, yet it will do very little about the temperature.

What you see here is over the next century. If you look at the black line—that is if we don't do anything. The red line is if we do Kyoto—that is, if the U.S. also did Kyoto and everybody stuck to this for the rest of the century, you would basically see postponing global warming for about 5 years.

Next slide.

You have all heard that the EU has just come out and proposed they would do a 20 percent cut of carbon emissions by 2020, yet the cost that will have will probably be about $90 billion. And it will do even less than Kyoto. It will only postpone global warming for about 2 years.

If you look at the last side, here which is Gore's solution, which is the one I have heard him say—until today where he obviously said a much greater number—he was actually suggesting cutting

emissions by 90 percent, which will be horrendously expensive; but if you look at the payroll tax proposal that he has come out with in 2006, the cost would be about $160 billion. It would mean $1.25 rise per gallon of gas. And it would basically postpone warming for about 4.5 years.

What this essentially tells us is that we can do, if we do it right now, we can cut emissions. Yes, it will be fairly costly and it will do very little good. That is not a very good idea.

Next slide, please.

Al Gore also in his discussion, and many others, will say, well, but maybe it is not actually going to be costly, maybe it will actually be an advantage to us. And then he also referred to the Stern report which actually came out and said, yes, it is actually going to be an advantage. I would like to remind you that all peer-reviewed research shows that doing a lot about climate change is essentially a losing position.

If you look at this, this is an overview of all these studies that we have. The peer-reviewed you see over in the left-hand side of the corner. You basically see the damages are about 1 percent of GDP, on average, and the cost of doing parts of this is about 2 percent.

So it is a bad idea to give 2 percent to obtain less than 1 percent. And the Stern report turned those figures around. But I should also warn you that they were basically basing themselves on all the other peer-reviewed studies. So I would say, if anything, the Stern report probably was not very representative of what they were actually purporting to show. If anything, all peer-reviewed research that shows a cost/benefit tells us we should do fairly little now.

And I would like to just briefly show you why this is the case. And these are the same models that also the Stern review and also Al Gore would base himself on. It is basically because the cost comes now. The benefits come way into the future.

And this particular model—but I will submit they all look pretty much the same—you see the costs rising dramatically from now up until about the middle of next century, and then they level off. Whereas the benefits only cross far into the next century and, of course, you have to remember by then we will have built up a debt. So essentially the first generations to start profiting from the things that we do now against climate change are going to be born early in the 23d century.

You have to ask yourself whether there isn't better things to spend our money on first. And so my argument would be to say—and this is my solution that I think I would like to submit to you to consider—is to say we need a much longer-term, smarter way to deal with these issues. That would be, for instance, investing 0.05 percent of GDP in research and development in noncarbon-emitting energy technologies.

Essentially it would be much cheaper, about $25 billion a year on a global level. It would let each country do what they think is the best way. We are not going to be picking winners. We are essentially going to let markets do this. And in the long term, the point is we will be able to solve global warming much better than some of these proposals we have seen with EU and other proposals

of cutting emissions, like the Kyoto. This is simply a much cheaper way of doing much more good in the long run.

That leads me to the last and fourth point I want to briefly mention to you is that there are many other things where we need to focus. I also notice that one of the members talked about the Copenhagen Consensus. Basically Gore talks about our generational mission. And he talks about that we need to think about what is the future going to ask us. I think that is entirely right. We need to think about what is the future going to ask of us. He says they are going to say, what were you thinking? What on Earth were you thinking? Why weren't you concerned about doing the most good first? And I think that is entirely true.

But of course what they are going to be asking us is why were you spending $180 billion a year doing virtually no good 100 years ago from now, where you could have spent so much more money on better things. I would like to compare this very briefly, for $75 billion a year we could solve all major basic problems in the world. We could give clean drinking water, sanitation, basic health care and primary education to every single human being on the planet.

So, again, the question is do we want to be remembered as the generation who did a little good or a lot of good for a lot of money or a little money? The basic point here is that it is not that hard of a question.

And that of course leads me to the Copenhagen Consensus where we asked some of the world's top economists, including four Nobel laureates, to look at all the different things we can do in the world. And we asked them, where do you get the most bang for the buck? This is what they came up with. They basically told us we should prevent HIV-AIDS; we should prevent micronutrient malnutrition, ensure free trade, and prevent malaria. If we do that, for every dollar we spend we would probably end up doing about $40 worth of social good. That is a very good investment.

On the other hand they showed, down at the bottom they showed the Kyoto Protocol and several other ways to deal with global warming, basically telling us it is a bad investment, not that you waste the money, but for every dollar you spend you probably end up doing 25, 30 cents worth of good.

And so the question is, do we want to be remembered as the generation who spent dollars and did 30 cents' worth of good for each dollar, or do we actually want to be remembered as the one who did $40 worth of good for the world?

And so basically my point here is not that there is no global warming. There is. And Al Gore should be thanked for putting that on the agenda.

On the other hand, we also need to get a sense of proportion. We are not likely to make good judgments if we vastly exaggerate the bad consequences of global warming and forget the positive incidences of global warming. And that also means we need smarter solutions. The solutions that are being proffered right now are doing very little good at very high cost. There are much better ways to do it; for instance, investment in research and development. That will enable our kids and grandkids to deal with many of these issues instead of having a situation where we virtually spend lots of money doing very little good. And we also need to re-

member if we are really talking about our generational mission, global warming is not the only issue. There are many other things that our kids and grandkids will judge us: Did you actually do the best you could with the money you were going to spend? Did you spend it on vast, frivolous projects like the Kyoto Protocol? Or did you actually spend it on a lot of things that would end up doing a lot of good for the world first?

The point is we need to think about other issues. But as this is a discussion on climate change, we need to ensure that we do it smartly and efficiently.

Thank you Mr. Chairman.

[The prepared statement of Mr. Lomborg follows:]

Perspective on Climate Change

Prepared by Bjørn Lomborg, adjunct professor at Copenhagen Consensus Center, Copenhagen Business School for the Subcommittee on Energy and Air Quality joint hearing with the Subcommittee on Energy and Environment of the Committee on Science and Technology on Wednesday March 21, 2007.

Introduction

Climate is back on the agenda, thanks to a large degree to my co-presenter, Al Gore. The climate discussion was strong in 1992 when it was put on the agenda by the Earth Summit in Rio and through the Kyoto Protocol agreed in 1997. Gore deserves applause for making global warming cool again.

However, in this presentation I will move beyond recognizing the importance of global warming and ask how we should view it, deal with it and put it in perspective.

I will make 4 basic points.

1. Global warming is real and man-made. This point has been made in many places, but perhaps most strongly and convincingly by the IPCC (2007a).
2. Statements about the strong, ominous and immediate consequences of global warming are often wildly exaggerated, as I will show below.
3. We need a stronger focus on smart solutions rather than excessive if well-intentioned efforts.
4. We need – as this hearing asks for – to put global warming in perspective. Climate change is not the only issue on the global agenda, and actually one of the issues where we can do the least good first.

Let us be frank. Al Gore and the many people he has inspired have good will and great intentions. However, he has got carried away and come to show only worst-case scenarios. This is unlikely to form the basis for a sound policy judgment. The problem is compounded in that if we follow Al Gore's recommendations, we will likely end up choosing very bad policies to solve the many problems, we agree need attention.

In short, following Gore's logic, with its good will and fine intentions, will actually end up costing millions of lives.[1]

Let me lay out the argument for you.

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[1] Take malaria. Dealing with malaria by affecting a change in global warming through the Kyoto Protocol will probably save in the order of 0.1% of annual malaria deaths averaged over the century (289.5m/9109.5m * 7%/2 (Arnell et al., 2002:439; Wigley, 1998:2287) or save about 1,000 lives each year (at 1m deaths, (Awash & UN Millennium Project. Working Group on Malaria., 2005:1). In comparison, a targeted approach could cut malaria deaths by 75% or 750,000 per year averaged over the century. (Notice, because of growth in population and climate effects, the actual numbers would probably be about 1,400 and 850,000 on average over the century.) Moreover, the cost of Kyoto would be $180 billion annually, compared to just $3 billion annually for the targeted malaria policy (Awash & UN Millennium Project. Working Group on Malaria., 2005:2; Weyant & Hill, 1999). Kyoto would therefore save 140,000 people at 60 times the cost, whereas a targeted malaria policy would save more than 85 million. Not initiating the targeted malaria policy first means forgoing saving – or simply costing – 85 million lives.

Global warming is real and man-made

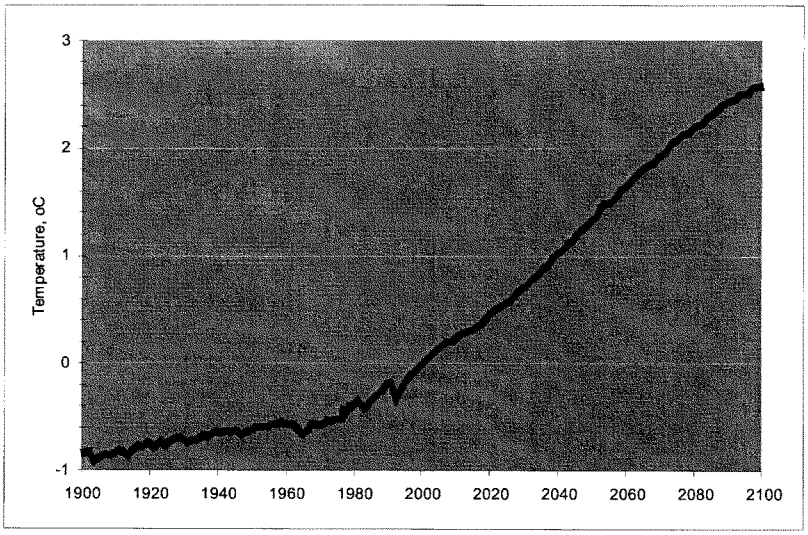

Figure 1 Expected temperature increase from 2000-2100 in the business-as-usual scenario (with simulation of temperature increase from 1900-2000).[2]

I would argue that our best information comes from the UN Climate Panel, the so-called IPCC (the Intergovernmental Panel on Climate Change). In Figure 1, we have a simple, standard prediction for the coming hundred years from the medium scenario of the 2007 IPCC report. Here we are told that that over the century global mean temperatures will increase about 2.6°C (4.7°F) with a span of 1.8-4.0°C[3]

The total cost of global warming is anything but trivial, about $15 trillion.[4] Yet it is only about 0.5% of the total net worth of the 21st century, about $3,000 trillion.[5]

Consequences often vastly exaggerated

Global warming is being described in everyday media in ever more dire terms. The IPPR think tank (which is strongly in favor of CO_2 cuts) in 2006 produced an analysis of the UK debate. It summarized the flavor thus:

> Climate change is most commonly constructed through the alarmist repertoire – as awesome, terrible, immense and beyond human control. This repertoire is seen everywhere

[2] (IPCC, 2007a:14; , 2007b:fig 10.3.1) of A1B, described as the Business-As-Usual scenario, (Dai, Wigley, Boville, Kiehl, & Buja, 2001).
[3] And a span of this from 1.1-6.4°C (IPCC, 2007a:13).
[4] Estimated from (Nordhaus, 2006a).
[5] The discounted GDP of A1B economic output from (Nakicenovic & IPCC WG III., 2000).

> and is used or drawn on from across the ideological spectrum, in broadsheets and tabloids, in popular magazines and in campaign literature from government initiatives and environmental groups. It is typified by an inflated or extreme lexicon, incorporating an urgent tone and cinematic codes. It employs a quasi-religious register of death and doom, and it uses language of acceleration and irreversibility.[6]

This kind of language makes any sensible policy dialogue about our global choices impossible. In public debates, the argument I hear most often is a variant of "if global warming is going to kill us all and lay waste to the world, this has to be our top priority – everything else you talk about, including HIV/AIDS, malnutrition, free trade, malaria, clean drinking water may be noble but utterly unimportant compared to global warming." Of course, if the deadly description of global warming were correct, the inference of its primacy would also be correct, but as we will see, global warming is nothing of the sort. It is one – but only one – problem of many, we will have to tackle through the 21st century.

Very clearly this is seen in the Gore's own description of his movie, *An Inconvenient Truth*. Here it is said that:

> We have just ten years to avert a major catastrophe that could send our entire planet into a tail-spin of epic destruction involving extreme weather, floods, droughts, epidemics and killer heat waves beyond anything we have ever experienced.[7]

Yet this is simply incorrect, both as it stands and in its policy conclusions. Let us look at heat deaths, sea level rise, hurricanes and malaria as outstanding examples of Gore's claim.

Heat and cold deaths

Very often, we only hear about the heat deaths but not the cold deaths – and sometimes this is even repeated in the official literature, as in the US 2005 Climate Change and Human Health Impacts report, where heat is mentioned 54 times and cold just once.[8] We need to know just how much more heat deaths we can expect compared to how many fewer cold deaths.

Much has been made of the heat wave in Europe in early August 2003, which killed 35,000 people, with 2,000 deaths in the UK.[9] Yet, each year more than 25,000 people die in the UK from cold.[10] It can be estimated that every year more than 200,000 people die from excess heat in Europe.[11] It is reasonable to estimate that each year about 1.5 million people die from excess cold in Europe.[12] This is more than seven times the total number of heat deaths.[13] Just in this millennium Europe have lost more than 10 million people to the cold, 300 times the iconic 35,000 heat deaths from 2003. That we so easily forget these deaths and so easily embrace the exclusive worry about global warming tells us of a breakdown in our sense of proportion.

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[6] (Ereaut & Segnit, 2006:7).
[7] http://www.climatecrisis.net/aboutthefilm/, accessed on March 17 2007.
[8] (Ebi, Mills, Smith, & Grambsch, 2006), see also (Basu & Samet, 2002; McMichael, Woodruff, & Hales, 2006) which *only* talks about heat related deaths.
[9] E.g. (Gore & Melcher Media, 2006:74-75).
[10] (BBC Annon., 2006)
[11] 207,000; based on a simple average of the available cold and heat deaths per million, cautiously excluding London from (Keatinge et al., 2000:672), and using WHO's estimate for Europe's population at 878m (WHO, 2004:121).
[12] 1.48 million estimated in the same way as total heat deaths.
[13] It is about 15% of the total death toll from Europe, (9.56m deaths, (WHO, 2004:121)).

The important fact, of course, is what will happen with future temperature increases. Let us for the moment assume – very unrealistically – that we will not adapt to towards the future heat. Still, the largest European study conclude that for at least for 2°C, "Our data suggest that any increases in mortality due to increased temperatures would be outweighed by much larger short term declines in cold related mortalities."[14] For Britain it is estimated that a 2°C increase will mean 2,000 more heat deaths but 20,000 fewer cold deaths.[15] A paper trying to incorporate all studies on this issue (a so-called meta-study) and apply it to a broad variety of settings both developed and developing around the world found that "global warming may cause a decrease in mortality rates, especially of cardiovascular diseases."[16] For the US, the net *lower* death count from global warming in 2050 is estimated at 174,000 per year.[17]

Sea level rise

In its 2007 report, the UN estimate that sea levels will rise about 34.5cm over the rest of the century.[18] While this is not a trivial amount, it is also important to realize that it is certainly not outside the historical experience. Since 1850 we have experienced a sea level rise of about 29cm, yet this has clearly not caused major disruptions. Sea level rise is a problem, but not a catastrophe. Ask a very old person about the most important issues that took place in the 20th century. She will likely mention the two world wars, the cold war, the internal combustion engine and perhaps the IT revolution. But it is very unlikely that she will add: 'oh, and sea levels rose.'

It is also important to realize that new prediction is *lower* than the previous IPCC estimates. The new span is 18-59cm (midpoint 38.5cm), down from 9-88cm in 2001 (midpoint 48.5cm).[19] This continues a declining trend from the nineties (where the first IPCC expected 67 cm), and the 80s, where the US EPA projected several meters.[20]

But this information is much less troublesome than what we often hear from global warming advocates. Al Gore has perhaps made their point most forcefully in his book and film. In a very moving film clip he shows us how large parts of Florida, including all of Miami, will be inundated by 20 feet of water.[21] He goes on to show us equally strong clips of San Francisco Bay being flooded, the Netherlands being wiped off the map, Beijing and then Shanghai being submerged, Bangladesh be made uninhabitable for 60 million people, and even how New York and its World Trade Center Memorial will be deluged.

How is it possible that one of today's strongest voices on climate change can say something so dramatically different from the best science, as we see from the IPCC in Figure 2. The IPCC estimates a foot, Gore tops them 20 times. Well, technically, Al Gore is not contradicting the UN, because he simply says: "If Greenland melted or broke up and slipped into the sea – or if half of Greenland and half of Antarctica melted or broke up and slipped into the sea, sea levels worldwide

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[14] (Keatinge et al., 2000:672)
[15] (Keatinge & Donaldson, 2004:1096), (Langford & Bentham, 1995) likewise estimate 9000 fewer cold deaths.
[16] (W. J. M. Martens, 1998:342).
[17] (Bosello, Roson, & Tol, 2006).
[18] (IPCC, 2007b:10.6.5) says 29cm. A1B midpoint is 34.5cm (IPCC, 2007a).
[19] (IPCC, 2001:75).
[20] 1996: 38-55cm (IPCC & Houghton, 1996:364), 1992 and 1983 EPA from (Yohe & Neumann, 1997:243, 250).
[21] (Gore, 2006:59min ff; Gore & Melcher Media, 2006:196-209).

would increase by between 18 and 20 feet."[22] He is simply positing a hypothetical and then in full graphic and gory detail showing us what – hypothetically – would happen to Miami, San Francisco, Amsterdam, Beijing, Shanghai, Dhaka and then New York.[23]

But of course, the impact of the film clearly suggest immediate inundation, reinforced by such comments as rising sea levels around Beijing would mean that "more than 20 million people would have to be evacuated."[24]

Yet, take an overview of the simulations of Greenland sea level contributions.[25] None are higher than 3mm/year by the end of the century, whereas Gore's claim – if valid even in a century span – would have to be around 120mm or 40 times higher than the very highest model estimate. The IPCC estimate that Greenland is expected to contribute 3.5 cm over the century by itself, and with models indicating a lower estimate of 1cm and high estimate of 15cm.[26] This means that Gore's claim is 174 times higher than the IPCC, see Figure 2. It is unlikely that such an approach will lead to good policy initiatives.

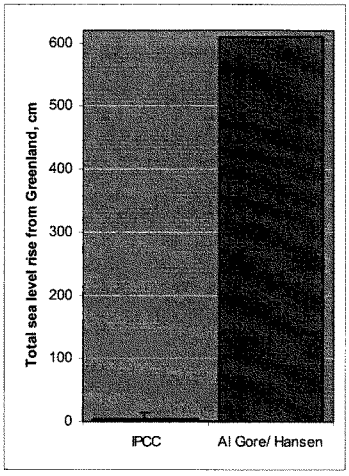

Figure 2 The estimate of Al Gore/Hansen of 21st century sea level rise due to Greenland melt. The IPCC estimate is 3.5cm, and uncertainty is indicated by the lowest (1cm) and highest (15cm) estimates from all available models. Al Gore and Hansen expect 609cm, or 174 times more.

[22] (Gore & Melcher Media, 2006:196)
[23] Yet, he also says: "First of all, this is not the worst case. The worst case, you don't want to hear! I think I'm right down the middle and in fact, the scientific community has validated the science in this film, and, for example, the six metre, six to seven metre sea level rise – that would come if Greenland broke up and slipped into the sea. It would come if west Antarctica, the portion that's propped up against the tops of islands with the warmer sea coming underneath it, if it went. If both went, it would be 12 to 14 metres" (Denton, 2006).
[24] (Gore & Melcher Media, 2006:204).
[25] (Gregory & Huybrechts, 2006:1721).
[26] (Gregory & Huybrechts, 2006:1721; IPCC, 2007b:10.6.4).

Hurricanes

Stronger and more frequent hurricanes have become one of the standard exhibits of the global warming worries. The solution offered is invariably CO_2 cuts and Kyoto.

With the strong 2005 hurricane season and the devastation of New Orleans by Katrina, this message has reverberated even more powerfully. Al Gore spends 26 pages on showing pictures of the suffering from New Orleans and names every single hurricane in 2005.

So has global warming caused stronger and more frequent hurricanes, and what will happen in the future? Let us here use the latest consensus statement from the UN World Meteorological Organization (parent organization for the IPCC), which is more recent and more specific but generally in agreement with the 2007 IPCC report.[27] It makes three strong and specific points.

> 1. Though there is evidence both for and against the existence of a detectable anthropogenic [human-caused] signal in the tropical cyclone climate record to date, no firm conclusion can be made on this point.[28]

They basically tell us that the strong statements of humans causing more and stronger hurricanes (or tropical cyclones as researches call them) are simply not well supported. We just don't know as of yet. When Al Gore tells us that there is a "scientific consensus that global warming is making hurricanes more powerful and more destructive" it is incorrect.[29]

> 2. No individual tropical cyclone can be directly attributed to climate change.

The strong statements on hurricane Katrina are simply not supportable.

This brings us to the third and perhaps most important WMO consensus point. In reality, we don't really care about hurricanes as such – what we care about is their damage. Do they end up killing people and cause widespread disruption? And with global warming, will they kill and disrupt even more? The answer is – perhaps surprisingly – that the whole hurricane debate is somewhat tangential to this important question.

> 3. The recent increase in societal impact from tropical cyclones has largely been caused by rising concentrations of population and infrastructure in coastal regions.[30]

The top part of Figure 3 clearly show us that the US cost of hurricane damage has increased relentlessly over the past century, and it seems to provide ample underpinning for Gore's "unmistakable economic impact of global warming." Yet, just comparing costs over long periods of time does not make sense without taking into account the change in population patterns and demography as well as economic prosperity. There are many more people, residing in much more vulnerable areas, with many more assets to lose. In the US today, the two coastal South Florida counties, Dade and Broward, are home to more people than the number of people who lived in 1930

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[27] (WMO-IWTC, 2006a, , 2006b; WMO, 2006). This was concluded in December 2006, whereas the material deadline for IPCC is early/earlier 2006.
[28] (WMO-IWTC, 2006b).
[29] (Gore & Melcher Media, 2006:92)
[30] (WMO-IWTC, 2006b)

in *all* 109 coastal counties stretching from Texas through Virginia, along the Gulf and Atlantic coasts.[31]

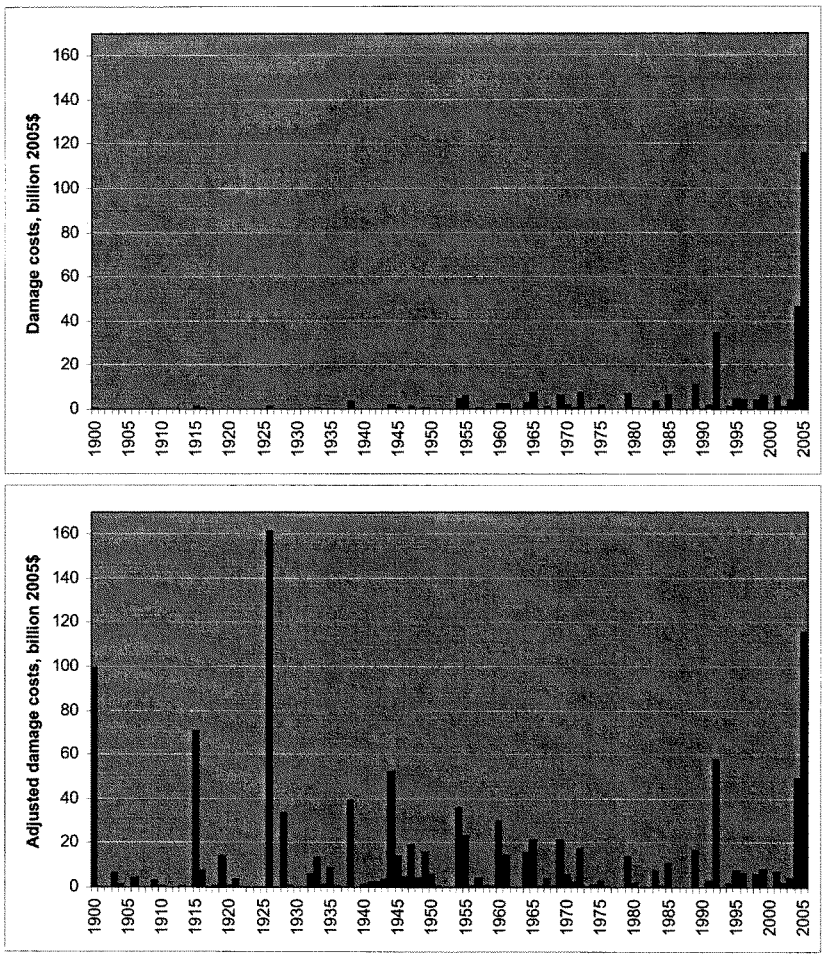

Figure 3 US hurricane damage, 1900-2005. Top panel shows the actual economic cost in 2005$, lower panel shows the cost, if the hurricanes had hit today. Damage for 1900-1925 is underestimated and more uncertain due to poor data availability.[32]

[31] (R. A. Pielke & Landsea, 1998).

In the top of Figure 3 we see the damage costs for rising through the century. Essentially no costs before mid-century, and just three years close to the present standing out. Here Katrina makes up two-thirds of the 2005 season costs, Charley and Ivan makes up most of 2004 and hurricane Andrew is responsible for almost all of 1992. It looks like a slam-dunk for climate-makes-badder-hurricanes.

But look what happens if you assume that all hurricanes would have hit the US as it is today, as can be seen in the lower part of Figure 3. Suddenly, the picture change dramatically. If the 1926 Great Miami hurricane had hit today it would have created the worst damage ever in the US hurricane history. What this tells us is that damages will continue to grow as long as more people with more stuff move closer to the sea.

We have to ask what it is we want. Presumably our goal is not to cut CO_2 emissions per se, but to do good for humans and the environment. We want to help the people who are potential victims of future Katrinas, Charleys and Andrews. But how can we best do that?

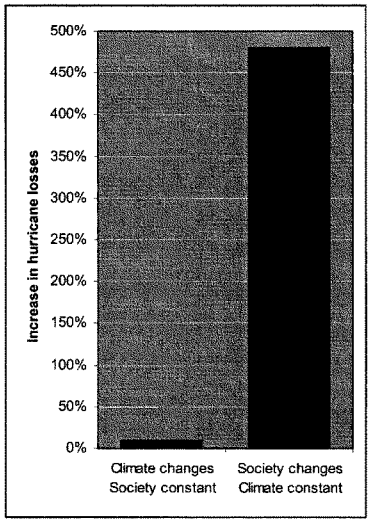

Figure 4 The relative importance of climate changes and social changes in hurricane damages from 2000-2050.[33]

In Figure 4 we see the relative impact of climate changes and social changes on hurricane damages over the next half-century. It essentially tells us the efficiency of turning the big knob of climate versus the efficiency of turning the social policy knobs.

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[32] (R. A. Pielke & Landsea, 1998; R. A. Jr. Pielke, 2006; R. A. Jr. Pielke et al., 2007), using PL normalization.
[33] (R. A. Pielke, 2005; Roger A. Jr. Pielke, Klein, & Sarewitz, 2000), an average of the three very similar climate increases and the A1 scenaro social increase.

If society stays the same – no more people living close to the coast, no more costly and densely built neighborhoods – and climate warms causing somewhat stronger hurricanes, the total effect will be less than a 10% increase in hurricane damages. To put it differently, if we could stop the climatic factors right now, we would avoid 10% more damage in 50 years time.

On the other hand, if climate stays the same – no more warming – but more people build more and more expensive buildings closer to the sea, as they have done in the past, we will see an almost 500% increase in hurricane damages. To put it differently, if we could curb societal factors right now, we could prevent 500% more damage in 50 years time.

So if we want to make a difference, which knob should we choose first – the one reducing damage by less than 10% or the one reducing damage by almost 500%? The difference in efficiency between the climate knob and the societal knob is more than 50 times.

> This seems to suggest that policies addressing societal factors rather than climate policies will do the much more good first.

Malaria

Al Gore writes: "Mosquitoes are profoundly affected by global warming. There are cities that were originally located just above the mosquito line, which used to mark the altitude above which mosquitoes would not venture. Nairobi, Kenya, and Harare, Zimbabwe, are two such cities. Now, with global warming, the mosquitoes are climbing to higher altitudes."[34]

Yet WHO and researches have documented that malaria epidemics happened in Nairobi many times between WWI and the 1950s.[35] The town's first medical officer, Dr. D.E. Boedeker, wrote that even for the early ivory and slave caravans, Nairobi "had always been regarded as an unhealthy locality swarming with mosquitoes."[36]

Like most stories there is at core some truth to the claim that malaria will increase with temperature, but it is a small part compared to richness and health infrastructure.

How much does global warming matters to malaria. One way to get an upper limit on the importance of global warming is to look at the projections of populations at risk. These models show an extra almost 300 million people will be living in areas that could harbor malaria in the 2080s because increasing temperatures expand the area where the parasite can multiply.[37] These models also tell us what will happen *without* climate change. Here, they project an increase from 4.4 billion in 1990 to 8.8 billion people at risk in 2085.[38] The total population at risk will thus be 9.1 billion out of a population of 10.7 billion.

But notice the proportions. 8.8 billion will be at risk from malaria in 2085 due to social factors, whereas 0.3 billion will be at risk due to global warming. Thus, even if we could entirely stop

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[34] (Gore & Melcher Media, 2006:173)
[35] (Hay, Guerra, Tatem, Atkinson, & Snow, 2005; Nakaji et al., 2004; Snow, Ikoku, Omumbo, & Ouma, 1999).
[36] (Reiter, 2007).
[37] (Arnell et al., 2002; P. Martens et al., 1999; van Lieshout, Kovats, Livermore, & Martens, 2004). Arnell finds 289.5m as average between unmitigated scenarios. We here use Arnell, since he is the only one to publish population at risk without climate, but he stays within the same framework and range of outcomes as the other referred articles.
[38] (Arnell et al., 2002:439).

global warming today (which we can't) we would only change malaria risk in 2085 by 3.2%.[39] More realistically, with the Kyoto Protocol, including the US and Australia, and committing everyone to constant emissions throughout the rest of the century, would reduce malaria risk by 0.2% in 80 years.[40] As the model team tells us: with a stringent climate policy "there is little clear effect even by the 2080s."[41]

Compare this to current expectations that we can cut malaria incidence to about half to three-foruths by 2015 for about $3 billion annually – or 2% of the cost of Kyoto.[42] This was the number 4 priority in the Copenhagen Consensus. Because we can do this within a decade whereas climate policy will take half a century or more, the difference in actual people helped is even more dramatic. Till 2085 Kyoto will avoid about 70 million people from getting infected by malaria (or about 0.1% of all malaria infections). Compare that to a simple and cheap halving of malaria incidence by 2015, which will avoid more than 28 billion people suffering from malaria.[43] This policy will do about 400 times more good, as is illustrated in Figure 5.

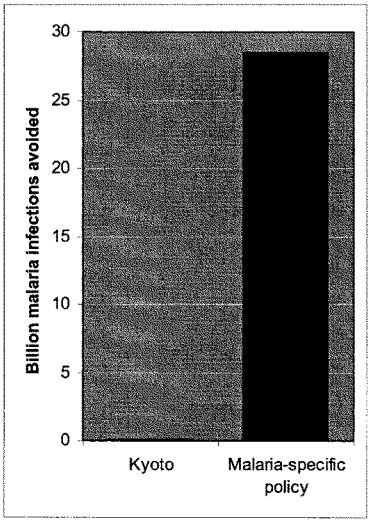

Figure 5 The number of people saved from malaria infects till 2085, by a full Kyoto policy and a policy to establish the Millennium Goal of halving malaria by 2015.[44]

[39] 289.5m/9109.5m.
[40] 289.5m/9109.5m * 7% (Wigley, 1998:2287).
[41] Speaking of 550ppm stabilization, (Arnell et al., 2002:440)
[42] (Awash & UN Millennium Project. Working Group on Malaria., 2005; Mills & Shillcutt, 2004:84-5).
[43] Calculated from 500 million actual annual malaria cases in 2000 and proportional from there with (Arnell et al., 2002:439).
[44] Based on (Arnell et al., 2002:439).

Smarter policies

The current raft of policies that are either enacted or suggested are costly but have virtually no effect.

Take the Kyoto Protocol, which even if it had been successfully adopted by all signatories (including the US and Australia) and even if it had been adhered to throughout the century, would have postponed warming by just 5 years in 2100 at a cost of $180 billion annually, see Figure 6.[45]

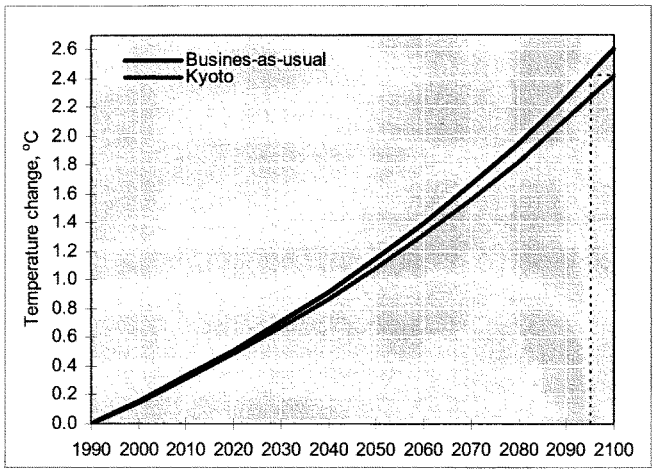

Figure 6 The expected increase in temperature with business-as-usual and with the Kyoto restrictions extended forever. Broken line shows the temperature for the business-as-usual scenario in 2095 is the same as the Kyoto temperature in 2100 (2.42°C).[46]

In the first real commitment since Kyoto in 1997, the EU announced in March 2007 that they would unilaterally cut emissions to 20% below 1990-levels by 2020.[47] This would mean a 25% cut of emissions from what they would otherwise have been in 2020.[48] Yet the effect on temperature would be smaller than Kyoto, as shown in Figure 7, postponing warming by the end of the century by about two years. The cost would be about $90 billion per year in 2020.[49] Thus, we see the same pattern from both the well-established Kyoto protocol and the new EU minus-20% decision – that they have fairly small impact at fairly high cost.

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[45] Cost average of all macroeconomic models with full Annex I trade, (Weyant & Hill, 1999).
[46] Based on (Wigley, 1998). He does runs for climate sensitivity of 1.5, 2.5 and 4.5°C, showing that they in all cases change about 7%. Thus, the graph here is adjusted for the IPCC middle scenario of 2.6°C.
[47] (EU, 2007c:12). Notice, that promising such goal is not reaching it. In the same EU document, EU actually starts out lauding the accomplishments of its Lisbon Strategy from 2000, "aimed at making the European Union the most competitive economy in the world" (EU, 2007b). A central target here is achieving 3% of GDP R&D. Yet, a recent LSE assessment shows that the target "will not be achieved by 2010"(CEP, 2006). Actually, while the EU average for R&D in 2000 was 1.86, the latest figures from 2005 have *declined* to 1.84% (for EU-27, for EU-15 it went from 1.92% to 1.91%) (EU, 2007a).
[48] (IEA, 2006:507).
[49] Estimated with (Nordhaus, 2006a).

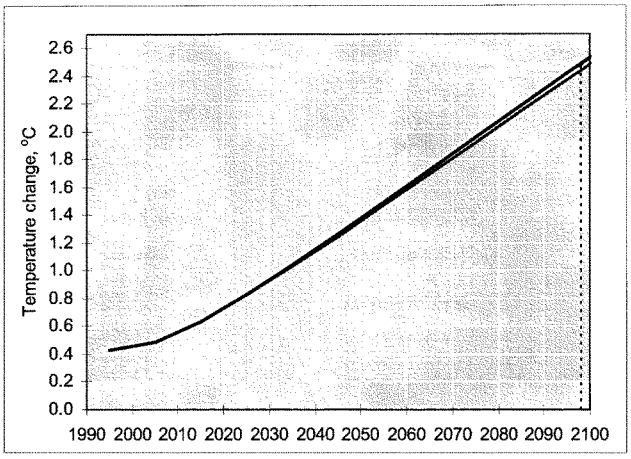

Figure 7 The expected increase in temperature with business-as-usual and with the EU minus-20% restrictions extended forever. Broken line shows the temperature for the business-as-usual scenario in 2098 is the same as the reduced temperature in 2100 (2.48°C).[50]

This is also the case for Al Gore's public commitment to tackle global warming. In his recent speech to New York University, he explicitly said that he would eliminate payroll taxes and substitute them with pollution taxes, principally a CO_2 tax.[51] Yet he never actually say how much this would cost or how much good it would do.

If one calculates the impact of such a promise, it shows that payroll taxes (social security) in the US amounted to $841 billion in 2006.[52] With the US emitting about 6Gt of CO_2 this means a tax of $140/t$CO_2$, and a tax on gas at about $1.25 per gallon.[53] In one respected model, the annual economic cost amounts to about $160 billion for the US economy in 2015. This would cut emissions to about half in 2015 and about 25% in 2105.[54] Yet, since the US will make up an ever smaller amount of the total CO_2 emitted throughout the century, the total effect in 2100 will be a reduction of global temperature by 0.1°C (see Figure 8).[55] Essentially, what Al Gore is suggesting is that the US carries through a Kyoto-type restriction all by itself.

[50] Estimated with (Nordhaus, 2006a).
[51] (Gore, 2006).
[52] (USCB, 2006).
[53] Extrapolation to 2006 from (EIA, 2006).
[54] Using (Nordhaus, 2006a), compared to business as usual.
[55] From 2.52°C to 2.43°C.

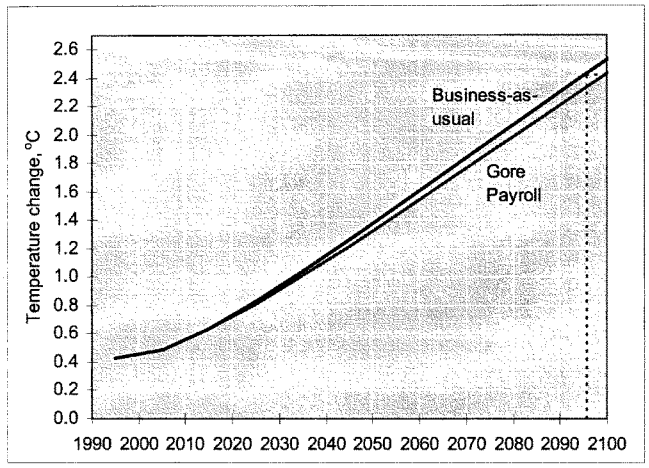

Figure 8 The expected increase in temperature with business-as-usual and with Al Gore's suggestion to replace payroll tax with a fixed carbon tax of $140/ton of CO_2, extended forever. Broken line shows the temperature for the business-as-usual scenario in 2095.5 is the same as the reduced temperature in 2100 (2.43°C).[56]

This is why the major peer-reviewed economic cost-benefit analyses show that climate change is real, and that we should do something but our cuts should be rather small. In the latest review the previous research is summarized:

> "These studies recommend that greenhouse gas emissions be reduced below business-as-usual forecasts, but the reductions suggested have been modest."[57]

This was the state of the art economics till October 2006, when a 600-page UK government report under economist Sir Nicholas Stern came out and created headlines everywhere.[58]

Virtually everyone have come away with the understanding that Stern has made a cost-benefit analysis and shown that the benefit (avoided cost of global warming) is 20% and the cost just 1% making strong climate action a slam-dunk.[59]

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[56] Estimated with (Nordhaus, 2006a).
[57] (Stern, 2006:298). This is similar to the conclusion from a meeting of all economic modelers: "Current assessments determine that the 'optimal' policy calls for a relatively modest level of control of CO_2" (Nordhaus, 1998:18)
[58] E.g. (Gibbon, 2006; Stern, 2006; Timmons, 2006). The UK UN counsellor said worldwide attention has gone "beyond the wildest expectations" of the UK government (Hagen, 2007).
[59] Even Prime Minister Tony Blair: "Stern shows that if we fail to act, the cost of tackling the disruption to people and economies would cost at least five per cent - and possible as much as 20% - of the world's output. In contrast, the cost of action to halt and reverse climate change would cost just 1%. Or put another way for every £1 we invest now, we can save at least £5 and possibly much more"(Blair, 2006).

Yet, a raft of academic papers have now come out, all strongly criticizing Stern, liberally using words as "substandard," "preposterous," "incompetent," "deeply flawed," and "neither balanced nor credible."[60] While there is a long list of problems with the analysis, I will just point out two issues.

1. The damages from climate change (the benefits of action) are vastly inflated. As several peer-reviewed papers point out, "the Stern Review does not present new data, or even a new model."[61] How can it then find conclusions that are completely outside the usual range? It turns out that the Review has counted damages several times, and somewhat arbitrarily increase the damages 8-fold or more according to new and conjectural cost categories that have never been peer reviewed.[62] At the same time, the review has decided to change a key parameter in all cost-benefit analyses to a value that gives huge damage.[63] Oddly, it forgets to use this parameter for the costs below, where it would count against a strong policy response.[64] The parameter is also vastly out of sync with our present-day behavior: it would suggest that we should today save 97.5% of our GDP for future generations.[65] This is patently absurd – today's saving rate is about 15% in the UK.

2. The costs of action are vastly underestimated, continuing a well-known 'appraisal optimism' which was also seen in the 1950s onwards in very low cost-estimates for nuclear power.[66] Again, it finds itself on the edge of the state-of-the-art and simultaneously forgets to count any costs after 2050, although they presumably continue way into the 23rd century.[67]

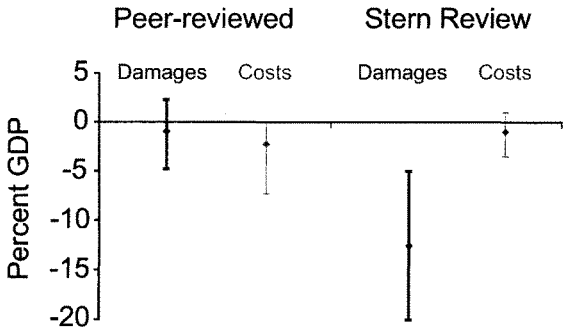

Figure 9 Comparison with the peer-reviewed state-of-the-art and the Stern review estimates of damage and costs.[68] As you can see, damages in peer-reviewed studies are not bad enough to warrant the costs of partially avoiding them. Stern swaps this argument around.

[60] (Byatt et al., 2006; Carter, de Freitas, Goklany, Holland, & Lindzen, 2006; Dasgupta, 2006; Nordhaus, 2006b; Tol, 2006; Tol & Yohe, 2006; Varian, 2006; Yohe, 2006).
[61] (Byatt et al., 2006:203; Tol & Yohe, 2006:235).
[62] (Byatt et al., 2006:204-5; Tol, 2006:979; Tol & Yohe, 2006:238)
[63] (Tol, 2006:979; Tol & Yohe, 2006:238).
[64] They simply stop counting the cost after 2050, while the cost escalates from 2.2% to 6.4% of GDP in 2100 (Tol & Yohe, 2006:239).
[65] (Dasgupta, 2006).
[66] (Byatt et al., 2006:206).
[67] (Tol & Yohe, 2006:239).
[68] (Tol & Yohe, 2006:235).

If you look at Figure 9 you see that Stern has essentially swapped the peer reviewed literature on costs and benefits, and that is why he get the opposite result of everyone else. The most well-known climate economist, Richard Nordhaus, concludes that the Stern review is "a political document."[69]

The Stern review must be praised for having put the economics squarely back into the climate debate. Whether or not we like to acknowledge it, doing something about global warming will have both costs and benefits, and we need the dialogue on how much we should do. But the Stern review does not change the fact that all peer reviewed economic analyses show we should only reduce CO_2 emissions moderately.[70]

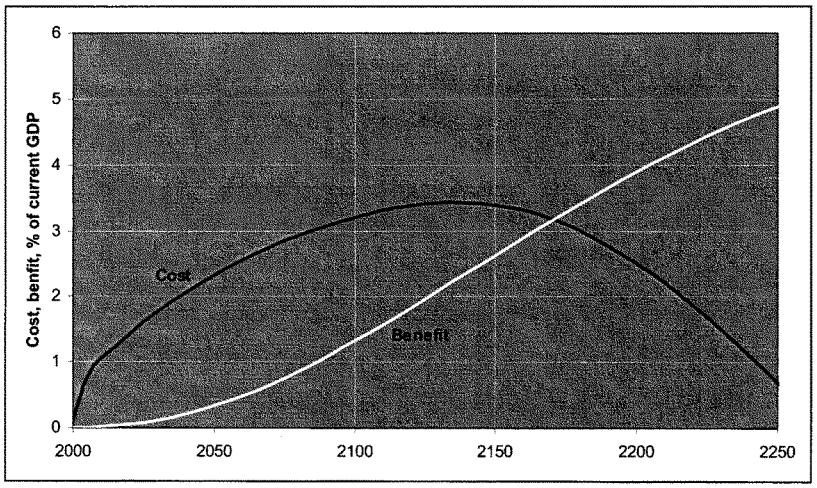

Figure 10 Cost and benefits over time of stabilizing at 1990 CO_2 levels.[71]

Why is this a robust result? If we look at costs and benefits over time in Figure 10 we see the reason. Essentially, the cost comes up front, whereas the benefit comes much further down the line. For the first 170 years the costs are greater than the benefits. Even when the benefits catch up in the late 22nd century, there is still a payback time before the total benefits outweigh the total costs around 2250. Thus, as one academic paper points out, "the costs associated with an emissions stabilization program are relatively large for current generations and continue to increase over the next 100 years. The first generation to actually benefit from the stabilization program is born early during the 24th century."[72]

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[69] (Nordhaus, 2006b:5).
[70] (Stern, 2006:298). This is similar to the conclusion from a meeting of all economic modelers: "Current assessments determine that the 'optimal' policy calls for a relatively modest level of control of CO_2" (Nordhaus, 1998:18)
[71] (Nordhaus, 2006a)
[72] (Kavuncu & Knabb, 2005:369, 383).

This does not mean we should do nothing at all about climate change. It means we need to be much smarter. We need to abandon expensive and inefficient strategies like Kyoto and search for new opportunities.

Of course, part of us still want to say "let's do it all". And I agree. In an ideal world we would deal with all the world's woes. We should win the war against hunger, end conflicts, stop communicable diseases, provide clean drinking, step up education and halt climate change. But we don't. And so we have to start face reality.

When we realize that there are many areas in the world – like HIV, malnutrition, free trade, malaria, clean drinking water etc. – where we can do immense amounts of good, it seem obvious to me we must focus our attention and our big expenditure there first.

But it does not mean we shouldn't start thinking about how we can cheaply tackle climate change in the long run. The big problem about cutting carbon emissions Kyoto style is that it costs a lot now, and does very little for the future. Moreover, if we paid the bill for cutting emissions down to 1990-level this year, we will have to pay just as much (or even a little more) next year to cut it to the same level. That is a bad deal. And it also means that for the next hundred years, we will have to negotiate ever more excruciatingly costly treaties between 192 countries, many of them poor countries like China and India, hungry for more power. That is going to be hard. Or looking just at Kyoto, maybe more like impossible.

The trick probably lies in understanding that what matters is not whether we cut a little now, but whether we eventually cut a lot. So maybe we should try going a different way.

Right now we could get all the world's energy from solar cells taking up very little (and otherwise useless) space. The equivalent of 2.6% of the area of the Sahara. Why don't we? Because it would be horrendously costly. But solar energy has come down in price about 50% per decade over the past 30 years. Even at a much lower pace, it will probably become competitive before mid-century for many uses, and before the end of the century for most uses. If we invested more in research and development (R&D) this development would probably go faster. Likely, such an investment would do much more good than Kyoto ever could, and be much cheaper.

And of course, solar power is but one – if very promising – opportunity. We have wind, that is already competitive some places, as in Denmark. We have carbon capture, fusion and fission, energy efficiency, biomass and biodiesel. It is hard to tell which will work best, but maybe we shouldn't. Maybe we should let nations search out these opportunities for the long-term benefit for the world.

My proposal for tackling global warming in the long run is that all nations commit themselves to spending 0.05% of GDP in R&D of non-carbon emitting energy technologies.[73] This approach

[73] The same kind of approach is built-in to the Asia-Pacific Partnership on Clean Development and Climate, which focuses on energy efficiency and diffusion of advanced technologies in electricity, transport and key industry sectors. Because it focuses on some of this century's biggest emitters, including China, India and the US, it is forecast to reduce global carbon emissions with 11% in 2050 (Fisher et al., 2006) – for reference, a full Kyoto would only reduce emissions by 9% in 2050. The cost, however, is unclear at the moment. It is seen as cheap and voluntary, but it is doubtful that entirely voluntary measures will achieve all of the AP6 potential. And certainly, in the long run, more smart measures will be needed.

would cost about $25 billion per year, seven times cheaper than Kyoto and many more times cheaper than a Kyoto II. It would involve all nations, with richer nations naturally paying the larger share. It would let each country focus on its own future vision of energy needs, whether that means concentrating on renewable sources, nuclear energy, fusion, carbon storage, or searching for new and more exotic opportunities.

Such a massive global research effort would also have potentially huge innovation spin-offs (a bit like NASA's going to the moon also gave us computers and velcro). Because the costs are low and there will be many immediate innovation benefits, countries do not have to be ever more strongly cajoled into ever more restrictive agreements. They will partake because it involves them in a strong, science-based endeavor. They will partake, because it is a smart thing to do.

And most importantly, it will likely have a much greater impact on the long-term climate.

Global warming only one of many issues

Global warming is not the only issue we need to tackle. This especially holds true for the third world. It is obvious that there are many other and more pressing issues for the third world, such as almost 4 million dying from malnutrition (underweight), 3 million from HIV/AIDS (unsafe sex), 2.5 million from indoor and outdoor air pollution, more than 2 million from lack of micronutrients (iron, zinc and vitamin A) and almost 2 million from lack of clean drinking water.[74]

Even if global warming exacerbates some or more of these problems, it is important to point out that the total magnitude of the problems is likely to far exceed the contribution from climate change. Thus, polices to reduce the total problems will have much more leverage than policies that only try to address the global warming part of the issues.[75] Again, we have to ask if there are better ways to help than by cutting CO_2.

We have to ask ourselves: what do we want to do first? Do we want to focus on cutting CO_2, at fairly high costs and doing fairly little good a hundred years from now? Or would we rather want to fix some of the many obvious problems in the world, where we could do a lot more good and do it now?

In the so-called Copenhagen Consensus process, we asked this general question to some of the smartest economists in the world: where would you spend extra resources to do good first?[76] Experts put forward their best solutions from climate change and communicable diseases, over conflicts, education, financial instability, governance & corruption, malnutrition and hunger, population: migration to sanitation & water and subsidies & trade barriers. But they didn't just say their proposals would do good – they said how much good they would do and how much they would cost.

A panel of top-level economists, including four Nobel Laureates then made the first explicit global priority list ever, shown in Table 1. It divided the world's opportunities into very good, good, and fair according to how much more good they would do for each dollar spent, and bad opportunities where each dollar would do less than a dollar worth of good.

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[74] (WHO, 2002:224).
[75] (Goklany, 2006:322).
[76] (Lomborg, 2004, , 2006). You can see more at www.copenhagenconsensus.com.

		Challenge	Opportunity
Very Good Opportunities	1	Diseases	Control of HIV/AIDS
	2	Malnutrition	Providing micro nutrients
	3	Subsidies and Trade	Trade liberalisation
	4	Diseases	Control of malaria
Good Opportunities	5	Malnutrition	Development of new agricultural technologies
	6	Sanitation & Water	Small-scale water technology for livelihoods
	7	Sanitation & Water	Common-managed water supply and sanitation
	8	Sanitation & Water	Research [illegible] water productivity in food production
	9	Governance	Lowering [illegible] of starting a new business

Table 1 Global priority list from Copenhagen Consensus, 2004.[77]

Preventing HIV/AIDS turns out to be the very best investment humanity can make – for each dollar it spends saving lives it will do about forty dollars worth of social good. For $27 billion, we can save 28 million lives over the coming years.[78]

Malnutrition kills almost 2.4 million lives each year. Perhaps even more dramatically, it affects more than half the world's population, by damaging eyesight, lowering IQ, reducing development and restricting human productivity. Investing $12 billion could probably half the incidence and death rate, with each dollar doing more than 30 dollars worth of social good.[79]

Ending first world agricultural subsidies and ensuring free trade would make almost everyone much better off. Models suggest that benefits of up to $2,400 billion annually would be achievable, which half of that benefit accruing to the third world. In achieving this, it would be necessary to bribe first world farmers, but the benefits of each dollar used would do more than fifteen dollars worth of social good.

Finally, malaria kills more than a million each year. It infects about two billion people each year (many several times) and causes widespread debilitation. Yet, an investment of $13 billion could cut incidence by half, protect 90% of newborns, and cut deaths of under-5s by 72%.[80]

At the other end of the spectrum, the Nobels placed climate change opportunities, including Kyoto at the bottom under the heading 'bad opportunities', underlining what we saw above, namely that for each dollar spent, we would end up doing much less than a dollar worth of good for the world.

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[77] (Lomborg, 2004:606).
[78] (Lomborg, 2004:104).
[79] (Lomborg, 2004:404-5)
[80] (Lomborg, 2004:109; , 2006:26-27).

But the Copenhagen Consensus did not just ask top economists. We asked 80 young college students from all over the world, with 70% from developing countries, with equal gender representation, and from arts, sciences and social sciences. After five days independently inquiring the experts in all the areas, they came to a surprisingly similar result as the Nobels. The placed malnutrition and communicable diseases on top, climate change next to last.[81]

In 2006 we asked a wide range of UN ambassadors to make their priority list after two days of intensive debates. Besides the three biggest countries China, India and the US, countries as diverse as Angola, Australia, and Azerbaijan participated, along with Canada, Chile, Egypt, Iraq, Mexico, Nigeria, Poland, South Korea, Somalia, Tanzania, Vietnam, Zimbabwe and many others. They came out with a quite similar list, placing communicable diseases, clean drinking water and malnutrition at top, with climate change towards the bottom.[82]

This should make us stop and pause. None of these forums have said that climate change is not real or not important. But they ask us to consider, whether we would do better by addressing the real and pressing needs of current generations that we can solve so easily and cheaply, before we try to tackle the long-term problem of climate change where we can do so little for so much.

To put it very bluntly, the Kyoto Protocol would likely cost at least $180 billion a year and do little good. UNICEF estimates that just $70-80 billion a year could give all Third World inhabitants access to the basics like health, education, water and sanitation.[83] More important still is the fact that if we could muster such a massive investment in the present-day developing countries this would also give them a much better future position in terms of resources and infrastructure from which to manage a future global warming. What would we rather do first?

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[81] (Lomborg, 2004:647)
[82] (Copenhagen Consensus, 2006), Kyoto is number 23, and the other proposals 37-40 of 40.
[83] (UNICEF, 2000:37).

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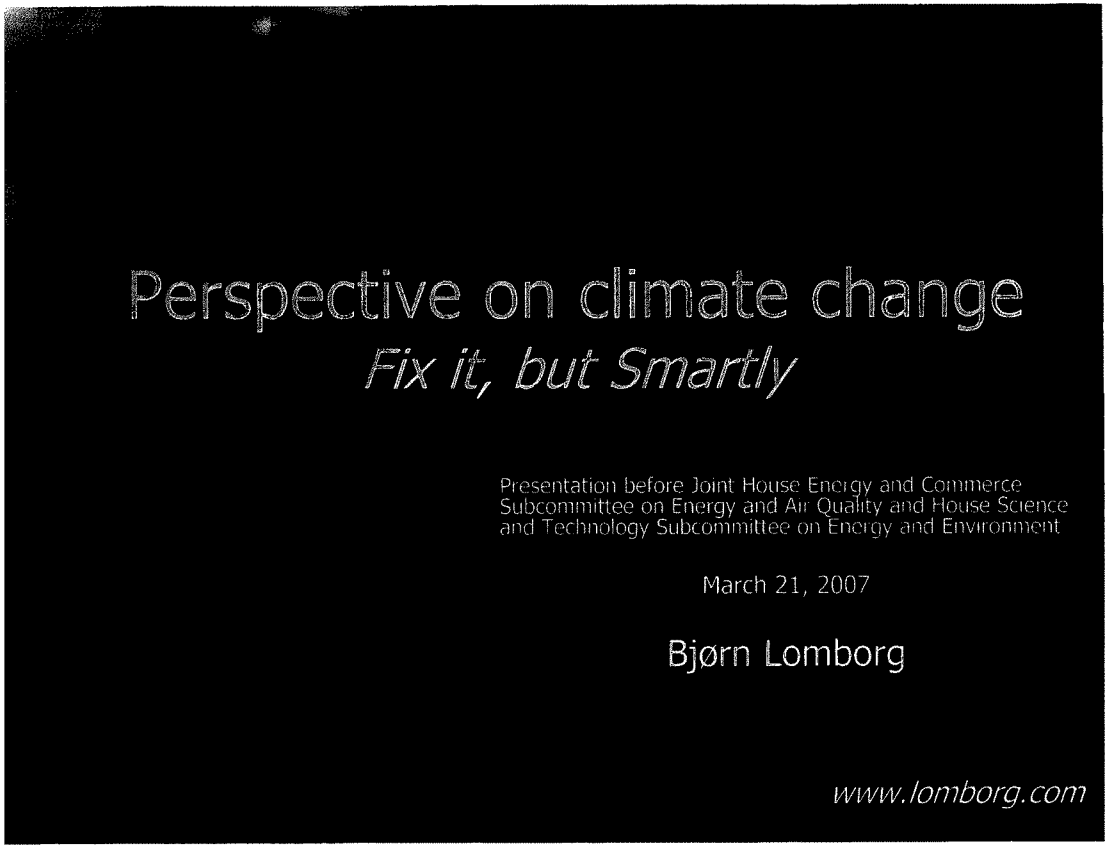
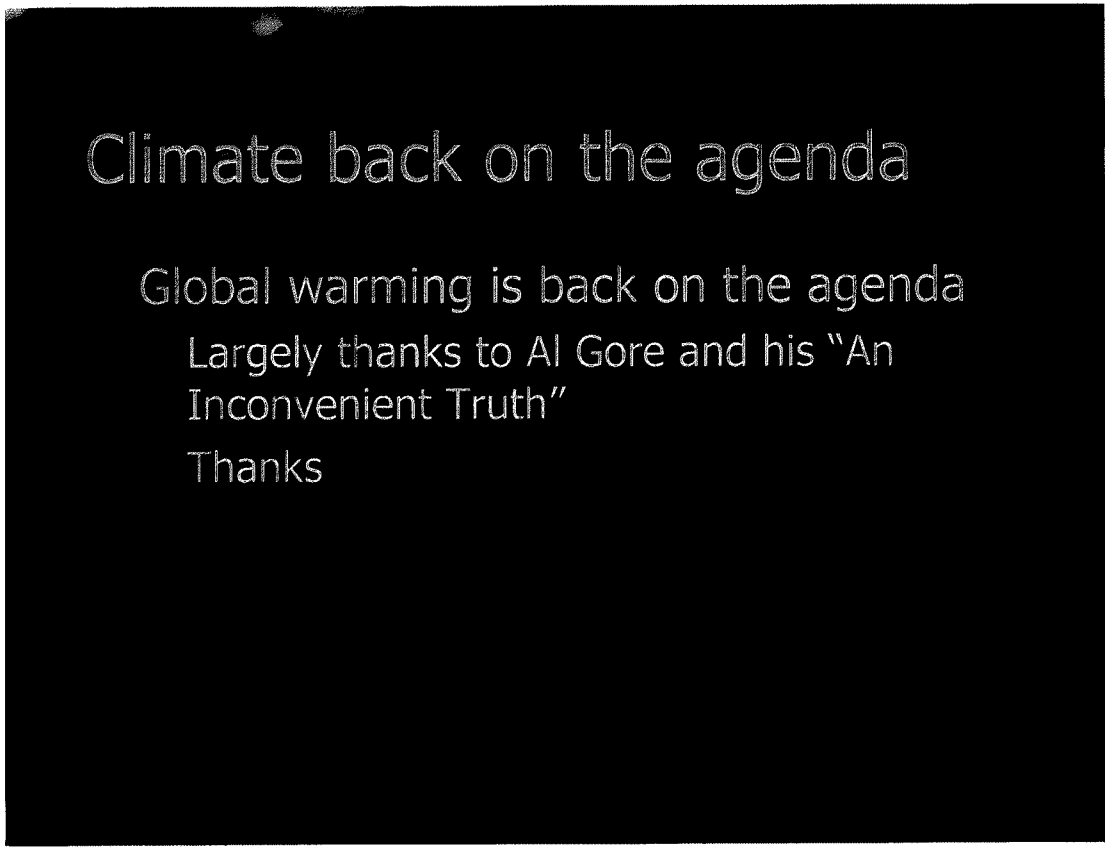
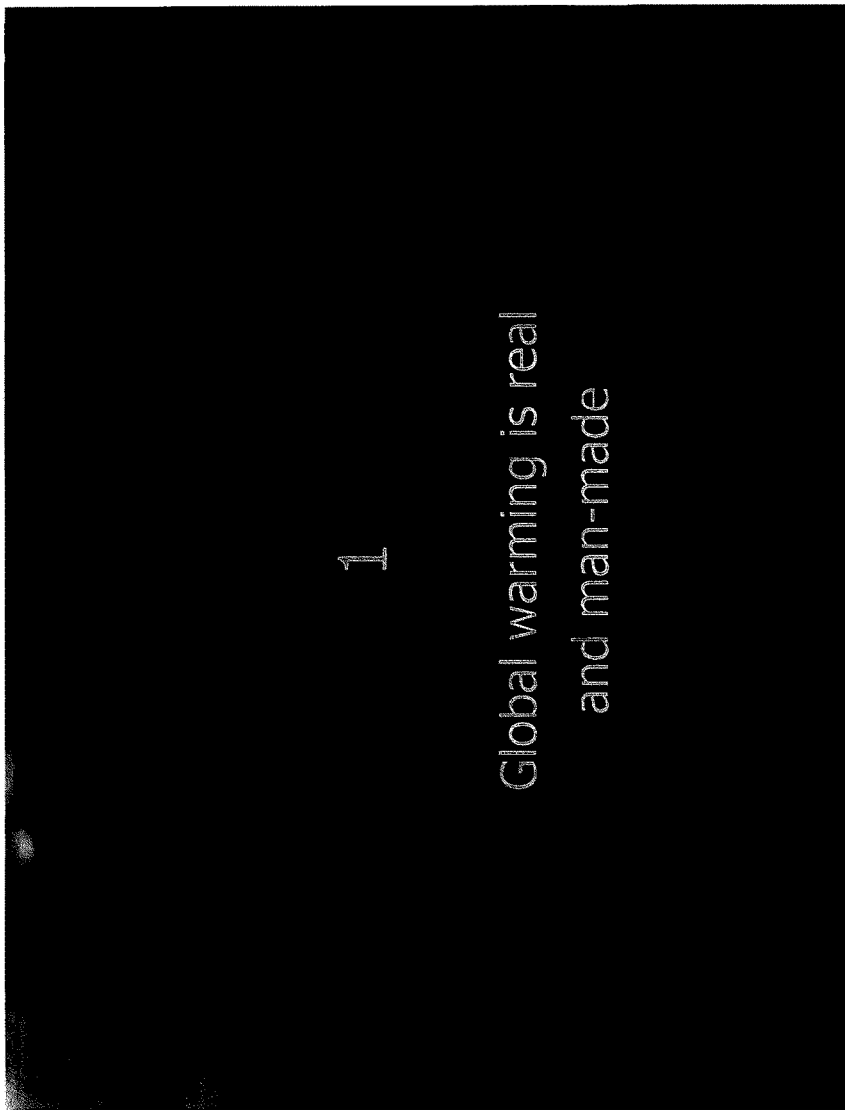
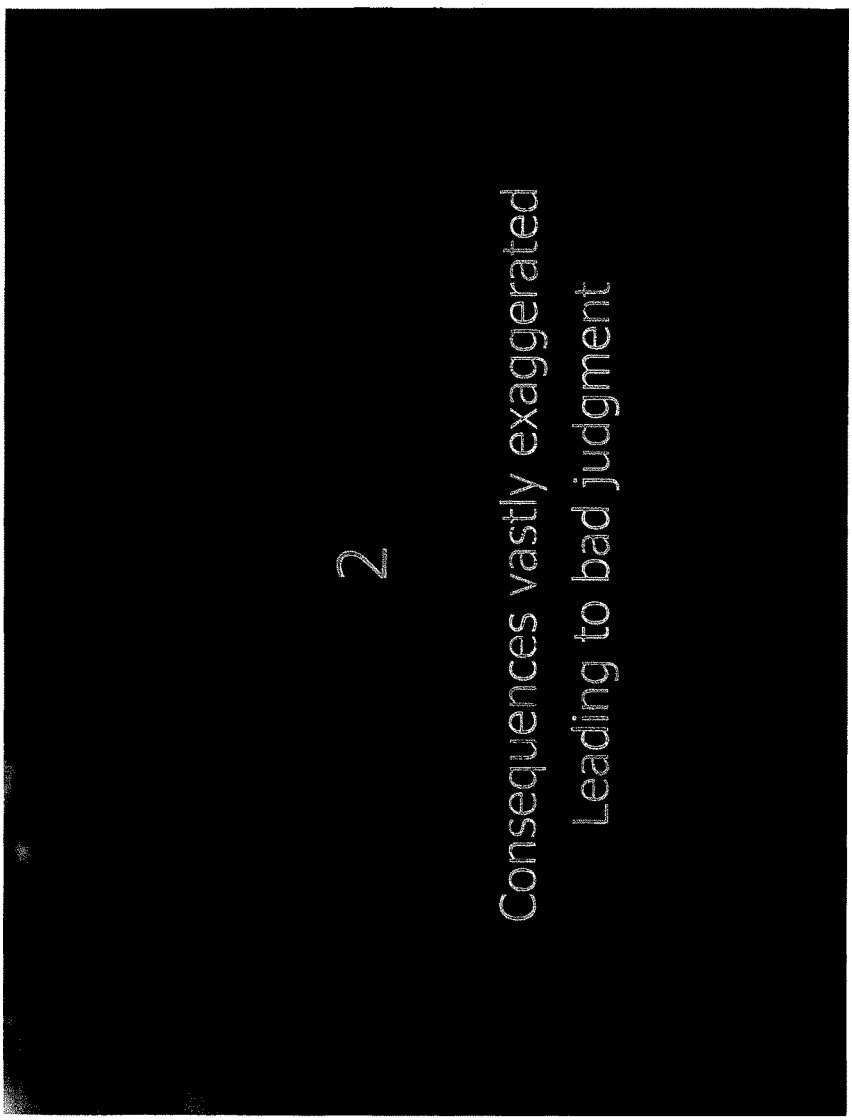

Perspective on climate change
Fix it, but Smartly
Presentation before Joint House Energy and Commerce Subcommittee on Energy and Air Quality and House Science and Technology Subcommittee on Energy and Environment
March 21, 2007
Bjørn Lomborg
www.lomborg.com


Climate back on the agenda
Global warming is back on the agenda
Largely thanks to Al Gore and his "An Inconvenient Truth"
Thanks

Four central points
Global warming is real and man-made
UN/IPCC conclusion
Consequences vastly exaggerated
E.g. Al Gore
We need smarter solutions
Not "now or never" but "now or later"
Climate change not the only problem
Many other, better solutions first


1
Global warming is real
and man-made

Climate change is real
On the agenda, thanks to Al Gore
The best information from the UN Climate Panel, IPCC
Likely temperature rise by 2100
2.6°C (4.7°F)
Total cost of $15 trillion
0.5% of 21st century $3,000 trillion GDP
Need *smart* strategy


2
Consequences vastly exaggerated
Leading to bad judgment

Al Gore and the standard story

- Gore and many others tell us
  - Planetary emergency
    - "We have just ten years to avert a major catastrophe that could send our entire planet into a tail-spin of epic destruction involving extreme weather, floods, droughts, epidemics and killer heat waves beyond anything we have ever experienced."
- Four central issues
  - Heat deaths
  - Sea level rise
  - Hurricanes
  - Malaria

1 Higher mortality with heat?

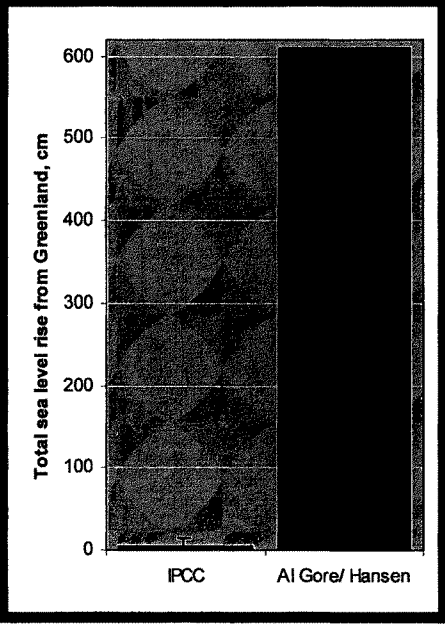
- Heat and cold deaths
  - In the UK
    - 2,000 more heat deaths by 2080
  - But fewer cold deaths
    - 20,000 fewer
  - Likewise in the US
    - 174,000 net fewer deaths by 2050

Bosello, Roson, & Tol, 2006; Keatinge & Donaldson, 2004; Keatinge et al., 2000

2 Sea level rise

- Sea levels will rise
- But not a catastrophe
  - About 1 foot over the next 100 years
    - Not Al Gores' 20 feet
  - About 1 foot the last 150 years
    - Did we worry?

Al Gore: melt from Greenland

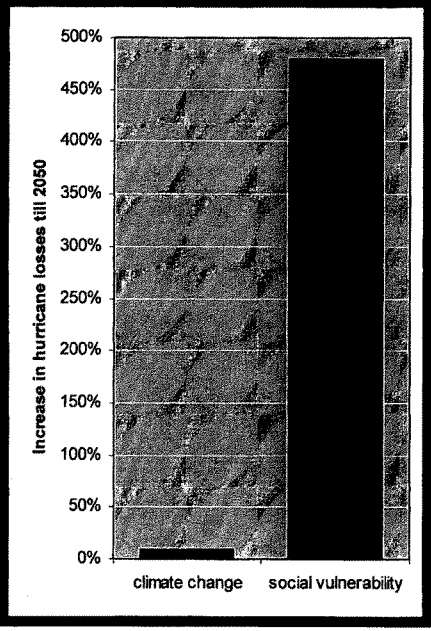


- Greenland till 2100
  - Gore predict 20 feet
  - IPCC predict 1.4 inch
    - This is 174 times exaggerated
    - Not helpful in a democratic debate
    - The impression of immediate inundation

3 Hurricanes:
ever costlier in the US
Damage costs from hurricanes in the US
Damage costs, billion 2005$
0
20
40
60
80
100
120
140
160
1900
1905
1910
1915
1920
1925
1930
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
Pielke et al. 2007

More people with more goods in exposed areas
Damage costs if all hurricanes had hit the US in 2007
Adjusted damage costs, billion 2005$
0
20
40
60
80
100
120
140
160
1900
1905
1910
1915
1920
1925
1930
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
Pielke et al. 2007

Hurricanes:
Fix climate or social vulnerability



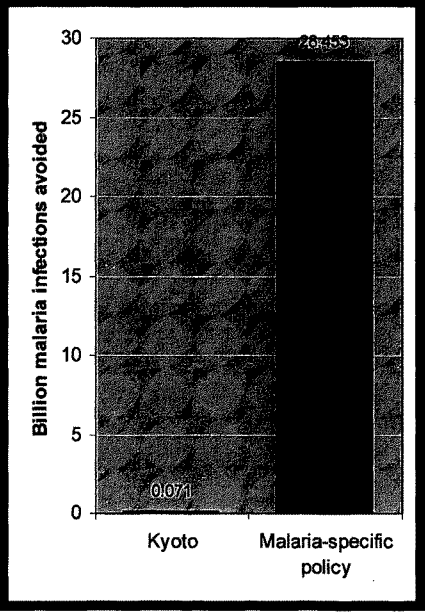
- If we stop climate change
  - Prevent 10% damage increase
- If we end social vulnerability
  - Prevent 480% damage increase
- Which knob should we focus on?

Pielke 2005

More malaria from heat?

- Malaria is weakly connected to heat
  - But much more dependent on wealth and treatment
    - Malaria endemic in Europe & US in little ice age
      - Even malaria in the Arctic circle
      - 20% malaria in Moscow in the 1940s
    - As economies strengthened, we dealt with malaria
      - Even as temperatures increased
    - Thus, with economic growth comes lower malaria
    - Is climate the right knob to turn?

Which knob to tackle malaria?



We can save 400 times more

At less than 2% of the cost

Media tends to over-worry

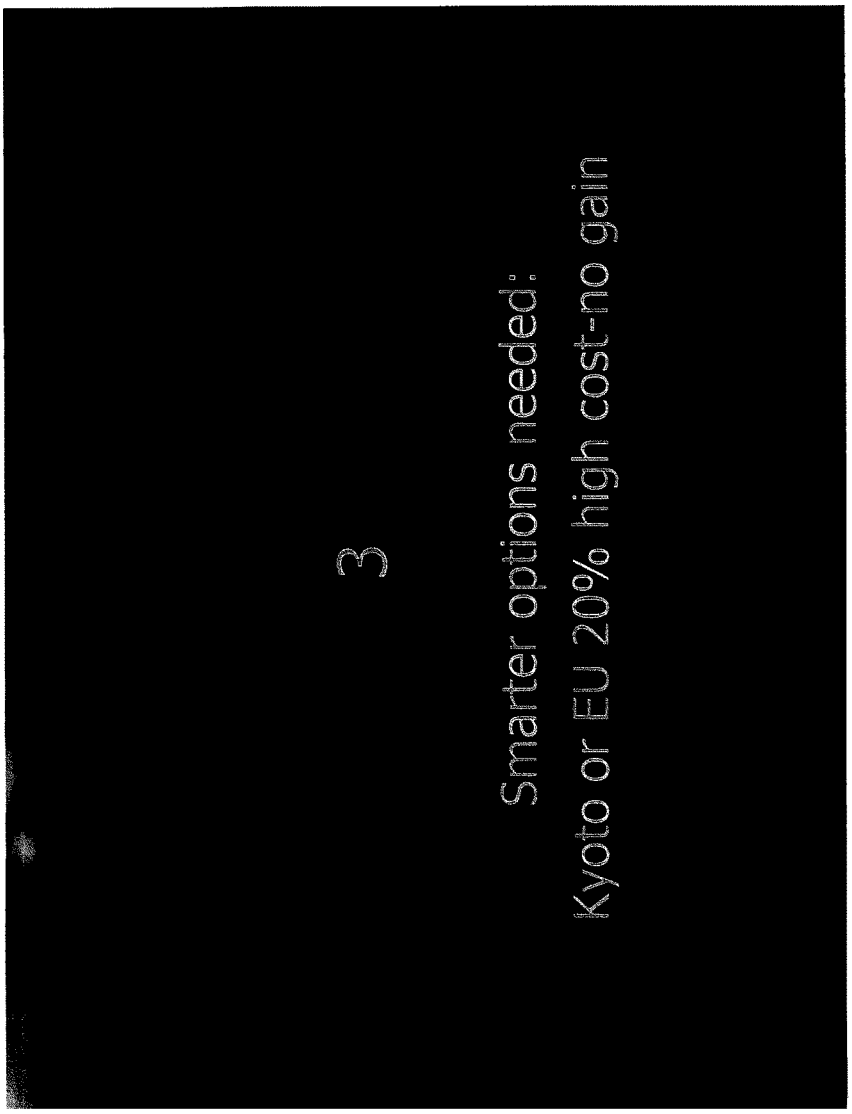
"The Ice Age Cometh?" 1975

"Threat of climatic changes"

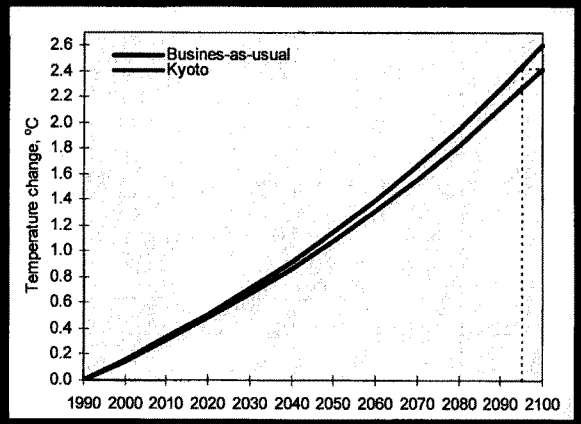
"Climate change: Chilling Possibilities"

- The unusually beneficial climate of the past few decades may be degenerating, facing humanity with a new cahllenge to survival
- We may be approaching the end of a major interglacial cycle.
- This transition would involve only a small change of global temperature – 2 or 3 degrees – but the impact on civilization would be catastrophic.
- Scientists once thought the onset of an ice age would be very gradual... but recent studies ... indicate the transition can be rather sudden.

Cover of Science News 1975


3
Smarter options needed:
Kyoto or EU 20% high cost-no gain

Kyoto: Postpone warming by 5 years

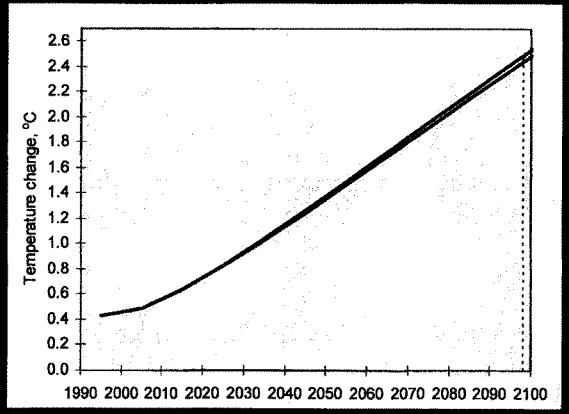


Cost of Kyoto

- $180 billion per year

Wigley 1998

EU's new 20% cut by 2020: Postpone warming by 2 years

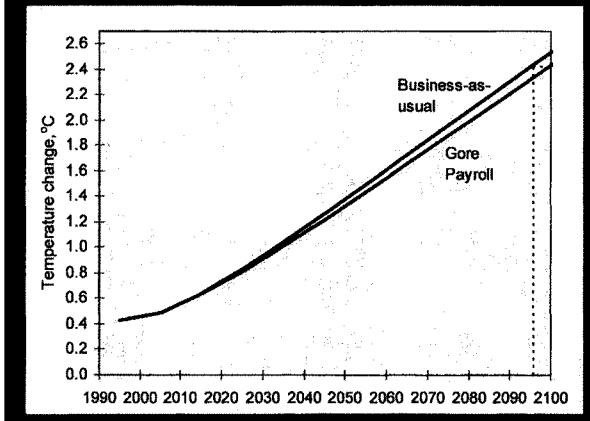


Cost

- $90 billion per year

Nordhaus 2006

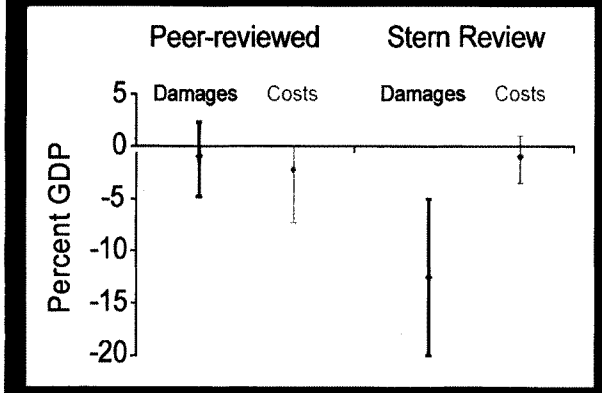
Gore solution: Postpone warming by 4.5 years



- Replace payroll tax
- Cost
  - $160 billion per year
- Consequence
  - $1.25 per gallon
  - Essentially, US do a Kyoto all by itself

Nordhaus 2006

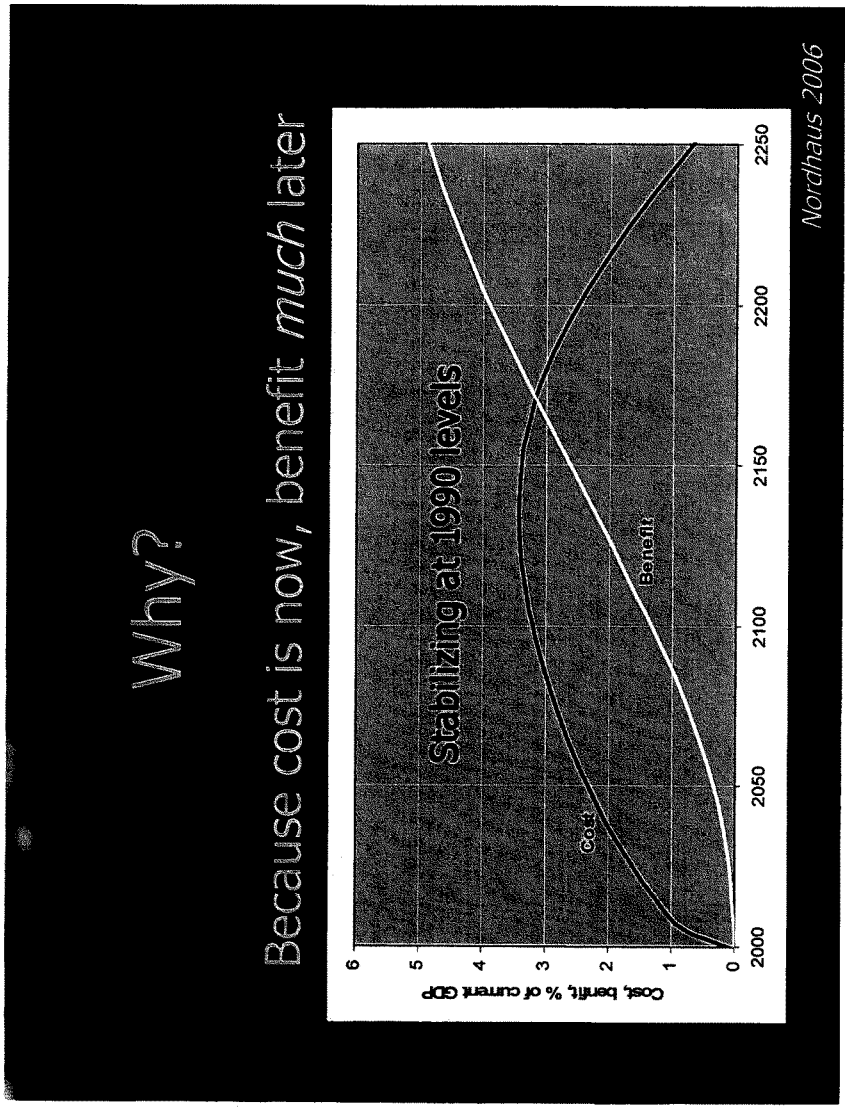
All peer reviewed cost-benefit show little effort now



Only Stern review shows otherwise

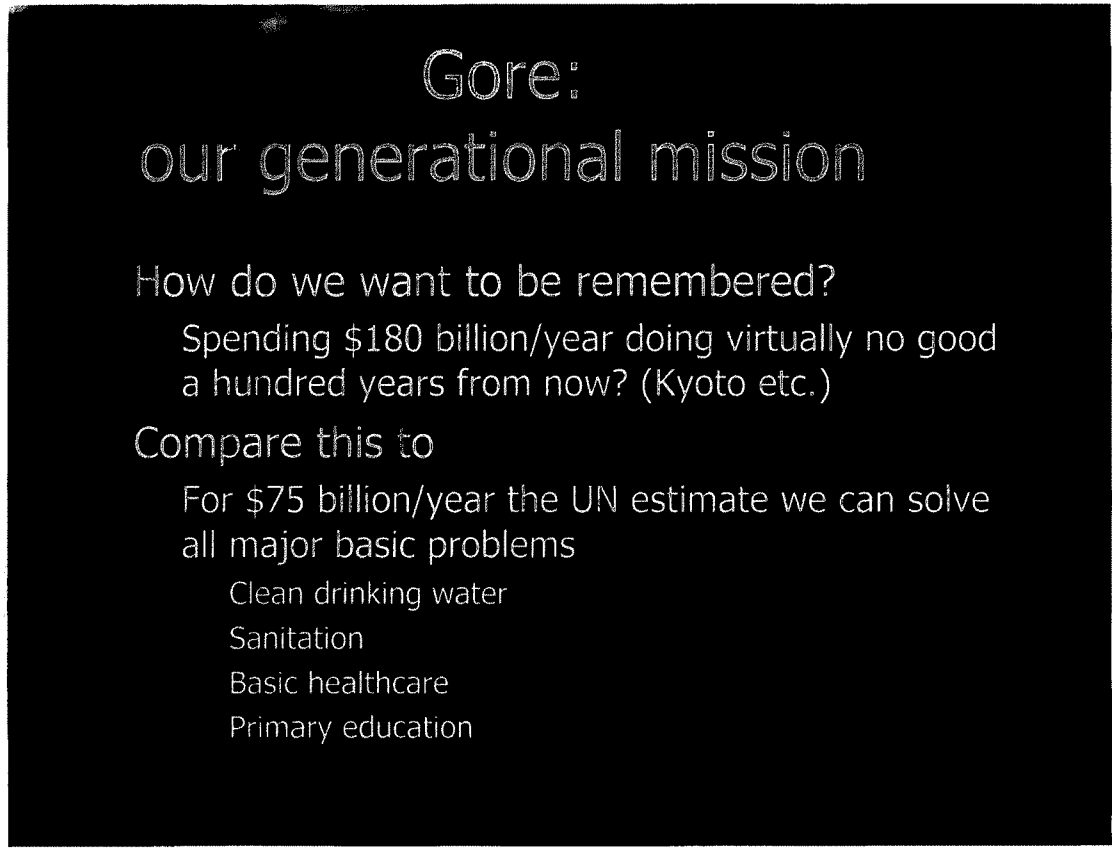
- Easily end up making policies that do more harm than climate change

Tol and Yohe 2006


Why?
Because cost is now, benefit *much* later
Stabilizing at 1990 levels
Cost
Benefit
Cost, benfit, % of current GDP
0
1
2
3
4
5
6
2000
2050
2100
2150
2200
2250
Nordhaus 2006

Smarter way forward
Long-term problem, long-term solution
Invest 0.05% of GDP in RD&D of non-carbon emitting energy technologies
$25 billion/year
Let each country focus on its own future
renewables, fission, fusion, conservation, carbon storage
Will solve global warming in the medium term

4
Many other problems where we can
do much more good


Gore:
our generational mission
How do we want to be remembered?
Spending $180 billion/year doing virtually no good a hundred years from now? (Kyoto etc.)
Compare this to
For $75 billion/year the UN estimate we can solve all major basic problems
Clean drinking water
Sanitation
Basic healthcare
Primary education

Copenhagen Consensus
Top economists: Most bang for the buck
Very good investments
1 Prevent HIV/AIDS
2 Prevent micronutrient malnutrition
3 Ensure free trade
4 Prevent malaria
...
Bad investments
...
16 Kyoto Protocol
Copenhagen Consensus

Summary
Global warming is real & man-made
Often wildly exaggerated
Harms our ability to make good judgment
We need smart decisions
Not fast, expensive and useless cuts but
long-term, cost-effective investment in R&D
Many other opportunities much better
Our real generational mission

Mr. INSLEE. Thank you Dr. Lomborg. We will now have another great leader on this issue from Tennessee, Bart Gordon, 5 minutes.

Chairman GORDON. Thank you Mr. Inslee.

And, Mr. Lomborg, welcome to the Energy and Commerce Committee and the Science and Technology Committee and welcome to America.

Mr. LOMBORG. Thank you.

Chairman GORDON. We take great pride in our freedom of speech here, but I do think it is fair to point out the different speech and opinion, and I just want for the record to give some of the reviews of your work from your home country.

The Danish Committee for Scientific Dishonesty was called to evaluate your work. Their analysis of your book concluded the following and I quote: "The publication is deemed clearly contrary to the standards of good scientific practice. Further, there has been such pervasion of the scientific message in the form of systematically biased representation that the objective criteria for upholding scientific dishonesty has been met."

Scientific America has a 12-page article entitled "Misleading Math About the Earth" dedicated solely to your book.

The National Academy of Sciences also here in America, member Norman Mayer said that you have not done a fraction of the homework that could give him a preliminary understanding of the science in question.

Finally, the prestigious scientific journal Nature described your work as, and again I am quoting, I don't really like this but I am quoting, "Employs a strategy of those who argue that Jews weren't singled out by the Nazis."

I just want to get this on record again. You are welcome here and your opinion is welcome. But for the record, I want to note that your opinion has been disputed in your country and elsewhere.

Mr. LOMBORG. Yes.

Chairman GORDON. I yield back the balance of my time.

Mr. LOMBORG. Can I comment on that?

Mr. INSLEE. Certainly, yes.

Mr. LOMBORG. Thank you very much for your welcome here. I do believe that it is important to say that the—I mean, there is clearly a lot of people out there who have been very critical of my work. That is absolutely true. I think it is curious, given the fact that this is the work not of me but, for instance, of the thing I was presenting here of the priority list of some of the world's most esteemed economists, including four Nobel laureates.

But you do mention the Scientific Committee of Dishonesty. Yes, it is very true that a lot people wanted me to be convicted. And the committee actually did just what you said. However, it also turned out on appeal that they actually hadn't done their homework. They actually had not done any justification for that decision.

And so what it really shows is that there are a lot of people out there who really would like me to be wrong, but they couldn't uphold it. It was actually canceled, and the quotation that you made actually comes from a verdict that has been overturned. I just want to make sure that that also gets into the record.

And likewise, Scientific American took four people to go through my book, three of whom I criticized strongly in the book. It is per-

haps not very surprising that they came up with the conclusion that I was wrong.

Now the curious thing—and I am not even going to talk about I think a lot of people felt it was very, very bad of Nature to do the Holocaust Jew thing now. But I would like to take just a moment, because it is not really a question of whether there are a lot of people out there criticizing me; it is much more a question saying, isn't it at least something we should be considering, that maybe our spending a lot of money right now, for instance, on Kyoto is not the best way to do this?

And at least I would like to engage here, and that is why I think this is such an important discussion to have. It is not a question of saying, you should buy all my views. But it is a question of at least thinking that just because there is this great momentum of oh, yes, let's do a lot of good, if our analyses show it is going to be very costly, if our analyses show that it is going to do very little good, shouldn't we at least consider whether there are smarter ways of moving towards this goal? And that, I think, is really my purpose of coming here, to make sure that we think this through and at least try to be smart about this.

Chairman GORDON. That is the reason you are here, to give another opinion, and we welcome you for that. And, as you say, it is healthy to be able to discuss it.

He was given my time.

Mr. INSLEE. Thank you. We will move on to Mr. Barton now. Mr. Gordon has yielded to Mr. Barton of Texas, 5 minutes.

Mr. BARTON. Thank you, Mr. Chairman.

Dr. Lomborg, thank you for being here. This is your book. I understand you have a new book coming out in September. I want the record to show that I haven't read all of it but I have read a good part of it. It is 350 pages, and then there are over 150 pages of bibliography and footnotes. What Dr. Lomborg has actually done is compiled, to the best of his ability, the most recent statistics and studies on not just climate change, but a minimum of other environmental issues and tried to get as much expert witnesses or experts' testimonies he can, and then use his own mind to evaluate the facts.

And my good friend from Tennessee put into the record the Denmark Committee on Scientific Dishonesty, what they said in January 2003 about his book, The Skeptical Environmentalist. I want to put on the record that was in January 2003.

In December 2003, the Danish Ministry of Science and Technology and Innovation, of which the DCST is a subdivision, completely rejected, completely rejected the DCST's finding that Lomborg's bomb was objectively dishonest. In fact, the Ministry found that the DCST's decision was not supported by documentation, offered no substantiation and was, I quote, "completely void of argumentation," and had shown—again I quote, "a significant neglect in its analysis."

So, I want to compliment you, Doctor, for agreeing to use your own mind to evaluate some of these theories and be willing to state opinions that are contrary to the politically accepted position. You are doing a service to mankind and a service to this debate to be here today.

Now my question for you. You are the originator and I think coordinator of something called the Copenhagen Consensus, where you invited leading experts in the environmental community and the social welfare community from all over the world to come to Copenhagen and try to rank various world problems and solutions to those world problems. Is that correct?

Mr. LOMBORG. Yes.

Mr. BARTON. Now, in that ranking, what was the No. 1 problem, and where did global warming/climate change rank?

Mr. LOMBORG. If I could just answer the question slightly broader, because I think that also goes to Mr. Gordon's point.

It is not to say that climate change is not important. Obviously people who work in climate change are going to say this is important, and that is indeed what the scientific community is telling us, and that is what Mr. Gordon is telling us. But likewise, of course, when you ask a malaria expert what is important, don't be surprised that the malaria experts say malaria is important. Everybody will say their turf is the most important thing; this is what we should be dealing with.

What we then try to do at the Copenhagen Consensus is essentially try to make a menu, with prices of all the different things we can look at. Yes, we can solve all these problems. Clearly we don't.

So at least we should have a conversation of, well, where can we do the most good first. And what they came out with is essentially telling us if we invest a dollar in HIV-AIDS we will probably end up doing $40 worth of social good. Investing it in malnutrition for micronutrients will probably do about $30 worth of good; free trade, probably $20; malaria, about $10 to $15 worth of good. Whereas Kyoto, as you also asked, came out next to the bottom. Probably for every dollar you spend you probably do somewhere between 25 and 30 cents' worth of good.

So it gives you a sense of what is it you want to shop. At the end of the day, of course, it is your job to make those decisions. But you at least now have a price list. So we are hoping instead, if you went into a restaurant and just got a menu and there were all these great options but no prices, that would make you a little uncomfortable. Now at least we put prices on there. And then, of course, democracies can deliberate what they want to pick first.

Mr. BARTON. Finally, in my last 20 seconds, I pointed out to the Vice President that in his charts he portrays that greenhouse gas emissions, principally CO^2, go up and then temperature goes up, when in point of fact the data that we have over the last 650,000 years shows that when temperature goes up first by an average of between 200 to 800 years. I pointed that fact out to the Vice President and he seemed unimpressed by it.

First of all, do I have my facts correct, or is the Vice President correct?

Mr. LOMBORG. You are correct. And you are also correct that that is a general point. On the other hand, I also tend to think it is an interesting discussion, I see why he would have picked out that because it is a very strong graph. It is probably he is right for the wrong reasons on that particular point.

Mr. BARTON. I was happy with, yes, I am correct.

I yield back, Mr. Chairman. Thank you, Doctor, for being here.

Mr. INSLEE. I yield myself 5 minutes.

Doctor Lomborg, my name is Jay Inslee. I am from Seattle. I want to compliment Denmark on some of your successes as you are heading to go 50 percent windpower on your electrical grid. That is an accomplishment. We think we could do great things in this country as well as if we adopt some policies to deal with this issue.

You have come to us, giving us sort of an analysis, largely an economic analysis. But many of us, many of our constituents, believe that we have a moral obligation not to damage the planet. And they believe, because of their belief in a higher power, that we have an obligation to take care of the Creator's garden. In Genesis we were given that obligation. Many people of different faiths share that moral obligation that we are not going to take away the polar bear from the grandkids or the salmon from streams or the Orcas or walruses, or you name it. This is a moral obligation that our generation has.

And I want to make sure I understand you. You are not here to tell us that under your belief, under your belief in a higher power, whether you have one or not, that that should be diminished and that we should believe in a God that would allow us to destroy the meaningful parts of this planet that we hold dear. You are not telling us that, are you?

Mr. LOMBORG. No.

Mr. INSLEE. I want to make sure of that.

Mr. LOMBORG. Yes.

Mr. INSLEE. I want to make very sure that you have come to us, telling us up here in Congress that if our constituents believe that they have a belief in a God that gives them an obligation to turn this planet over to our grandchildren as good as we found it, you are not telling us that that is not something we shouldn't follow, are you?

Mr. LOMBORG. No. Can I elaborate on that?

Mr. INSLEE. Not now. I only have 5 minutes. Well—go ahead. If you think that doesn't answer the question, go ahead.

Mr. LOMBORG. Basically, I think you are absolutely right, and I think we want to leave this planet as a better planet. However, I would also argue that it is hard to imagine that we would have a God that would not want us to save somewhere between 10 and 15 million people from HIV-AIDS over the next 10 years, and so on. There are a lot of things, 28 billion people who are getting infected by malaria. So we definitely want to do all these good things. My point is simply we want to leave the best planet we can.

Mr. INSLEE. I think I understand your point. Your point is to think that the United States isn't capable of dealing with HIV, malaria, and global warming at the same time.

Now maybe Denmark, with all due respect, isn't capable of dealing with those things. But I will tell you something about America. We are capable of dealing with HIV, malaria, and the commitment to our grandkids to not despoil the planet, because it is a moral obligation to do all three and we are going to do all three in the country.

Now, you have given us an economic analysis and I want to test your economic analysis, just how good you are in knowing what the

future costs or benefits of these actions will be. Many of us believe in America, because we are the people that put a man on the Moon, we are the people that perfected the Internet, we are the people that invented the lightbulb, that this is a tremendous economic opportunity for the United States of America.

And we believe that we have as much opportunity to grow our economy as opposed to being a cost to our economy. And the reason we believe that in the United States of America is because we have tremendous innovators in this country who have done a real crackerjack job whenever we have had a technological challenge.

So I want to ask what you know about the American economy. Are you familiar with the Nanosolar Company in Palo Alto, California?

Mr. LOMBORG. No.

Mr. INSLEE. They make a PV thin solar cell that could be market-based grid solar power in the next year.

Are you familiar with the Oscar of solar thermal power? They make solar thermal that may be grid competitive in the next 18 months. Do you know about the Verdiem Company in Seattle, Washington?

Mr. LOMBORG. No.

Mr. INSLEE. They make a product that can basically save 10 to 30 percent of your electricity because it will shut off your PC when you are not using it.

Do you know about the Range Company of Georgia?

Mr. LOMBORG. No.

Mr. INSLEE. It is a company that makes cellulosic ethanol that is up—they are going to start construction shortly—that can have a significantly reduced CO^2 footprint with cellulosic ethanol.

Do you know about the General Motors Volt?

Mr. LOMBORG. I have heard about it, yes.

Mr. INSLEE. General Motors Volt is where you plug in an electric car that is going to get 150 miles a gallon with zero CO^2 for the first 40 miles.

Now, the point I want to make is, with all due respect, your projections of the cost of what this is going to do, you have the sign wrong, as the Vice President said this morning.

We believe that this is an opportunity to sell products to China and to Denmark. You got the drop on us on Vestus, but we intend to do better next time. And we are going to start filling up ships, selling them to Beijing, with solar thermal technology and efficiency technology, and we are going to ship to the rest of the world the best clean energy technology ever invented. Now, that is a prospective Seattle.

If you want to make any comments, go ahead.

Mr. LOMBORG. Thank you very much. I appreciate your points. I will just really make two points.

One is you say America is a great country, and it is absolutely a great country, and it is definitely much bigger than Denmark. You say also that you will deal with both malaria, HIV, and global warming. And we could add on a few others like clean drinking water, and education, and all the problems in the world. I am very happy to hear that.

I would, however, ask respectfully why you didn't do so the last 10 years? Why haven't you solved all these problems? And I would like to at least have you recognize that apparently doing all these things is not so easy.

And let me just reflect on the point that while Gore was Vice President, the CO^2 emissions of the U.S. increased 18 percent and the development assistance declined from point 14 to point 10.

And so it does seem to say, suggest to me, that, no, not only can't you do everything, but actually you didn't do either of these issues. And that seems at least to be an important point.

The second thing that you talk about that is an opportunity——

Mr. INSLEE. Just conclude. I have to get to other speakers, if you can conclude fairly shortly.

Mr. LOMBORG. Yes. And the other one on the opportunity in cost, and I got the sign wrong. It is very easy for the Vice President to say you got the sign wrong. All I can say is just as we trust the IPCC, the U.N. Climate Panel, because it is a very large group of esteemed scientists looking at the world climate, looking at what the world climate looked like, I would probably imagine that the Nobel laureates and all the climate economists that we have are better able to get the sign right than I do—you or me.

So the point here, again really on the idea of saying the things that you mention, if they are indeed marketable and they actually work in this market now, great. But then we don't actually have to be considering it here. If they don't, then at least we have to have the conversation of saying, is that where we want to spend our money or would we rather want to spend it in a lot of other inventions that America could also greatly enhance humanity with?

Mr. INSLEE. I would decline your kind offer to comment on what would have happened had the election turned out differently.

Thank you very much. I would like to now recognize Mr. Hall of Texas for 5 minutes.

Mr. HALL. Dr. Lomborg you were here when the Vice President was testifying, were you not?

Mr. LOMBORG. Yes, I was.

Mr. HALL. And you heard me go over the word "costs" with him, and that I had repeated it, I think, eight times in there. And Mr. Bartlett helped me. He put two more words of "cost" in there and I asked Mr. Gore about the cost and read back to him what he said, that there are some who will say that acting to solve this crisis will be costly. I don't agree.

And then he goes on to say the way he would solve it would save money. And he pointed out, makes some sense that consequences of inaction would be devastating to both environment and economy. That is, of course, it would be devastating if we could afford even to get to that point.

Now, you had calculated, I think, that it costs about $25 billion a year worldwide, as opposed to $180 billion a year in the Kyoto-like system, and that it actually resulted in more reductions, had you not?

Give us the benefit of your opinion. You mentioned in your testimony that we need to be much smarter about climate change, meaning that we need to abandon expensive and inefficient strategies like Kyoto and search for other opportunities.

How about elaborating for us a little bit on that, if you would, on how investing in R&D would be a smarter way of dealing with this problem? And should we invest exclusively in next-generation energy sources or should we also invest in technologies to make existing resources more efficient, more affordable, and cleaner?

Mr. LOMBORG. Yes.

Mr. HALL. Give us for the record, your opinion on that and enlarge on it a little.

Mr. LOMBORG. Yes, thank you very much. Two things. Again, you are absolutely right. I didn't think that Al Gore answered the question about costs very well, and certainly if the cost really is negligible or even if it is going to be an advantage, it is hard really to see why we need to have these conversations because clearly everybody would just jump on it.

Essentially if all you have are lots of $50 bills lying around, you would imagine some people would be picking them up, and that doesn't seem to be something we would need to regulate. So at the end of the day, I think we need to realize that all peer-reviewed economic research tells us yes, costs are going to be significant. They are not going to be damaging our economy. I think one of the Democrats pointed out that some people go out and scare us with saying that this is going to ruin our economy. We are all going to basically have go to the poor house. That is not what we are talking about.

Kyoto is going to cost $180 billion of a $50 trillion economy in the world. It is not going to drive us to the poor house. But we could definitely spend that money better.

The second part of your question of how could investment in research and development actually do better, well the idea here really is to say right now estimates show that the cost of emitting an extra ton of carbon dioxide is about $2 per ton of carbon dioxide. It is the maximum reasonable—this is the latest of the meta study from Richard Toll, one of the most respected climate economists—the largest cost that we could reasonably envision is about $15 per ton of carbon dioxide.

Now, the problem is that most of the cost of cutting carbon emissions are much, much higher. The typical Kyoto cost is around $30, $40. Many of the proposals that we have seen here today, also Al Gore's proposal, is probably in the $100 or more. That is certainly also true for the Stern report.

So essentially we are standing in a situation where we say the damage is only $2, but we only have technology to deal with it if we are going to spend $100 per ton. That is a bad deal. We need to get those costs down.

Now, there are ways of doing that. One is to say let's cut emissions and thereby force industries and others to do those cuts. And, of course, they will probably try to find the smartest way to do it. But we pretty much know the answer to that. Maybe they can get it down to $100, down to I don't know, $80. But we would much, much rather say let's actually spend the money in research and development so that we can get that cost fundamentally much further down. And that is what research and development does. No, it shouldn't just be in renewables. It should be in all the different areas.

Mr. HALL. You do have people who don't believe in your summations or your conclusions in your home area, do you not?

Mr. LOMBORG. Oh, sure.

Mr. HALL. And people write good and bad about you?

Mr. LOMBORG. Yes.

Mr. HALL. Well, you are normal then. We suffer that same problem here.

My time is about out. I really wanted to get to you about the global cooling scare in the mid-1970's and how the scientists thought they knew what was causing the cooling, and then all of a sudden the debate shifted to global warming. So like an old lady at home, her husband died at 92, she said that old pipe finally got him. Here they ease off from cooling to warming.

And when did the debate shift to global warning, if you know?

Mr. LOMBORG. It shifted several times. We were worried about global cooling——

Mr. HALL. In the 1970's cooling scare.

Mr. LOMBORG. We worried about cooling in the early part of the 1900's, and 1930 we worried about warming, and we worried about cooling in the 1970's. The point is, though, I think it is important to say we have much better reason to worry about warming now. So I think we need to recognize that warming is a serious issue. And it is people that are much smarter than any of us in this room, although I am not sure I know everyone in here—but the really best people that we have in the planet telling us that this is a problem. I think we need to listen to them, but we also need to say, yes, but how much is it going to cost and how much good can it do?

Mr. HALL. Thank you. I yield back thank you.

Chairman GORDON [presiding]. Mr. Hastert is recognized for 5 minutes.

Mr. HASTERT. Thank you, Mr. Chairman. And, Mr. Lomborg, I appreciate you coming and spending some time. I know you had to fly all night to get here from Denmark, but I appreciate it.

You talk about malaria and HIV-AIDS and Asian flu and micronutrients, and we talk about the free trade and clean drinking water and education. I think that is part of the things that—I happened to be Speaker here for a number of years, and at every appropriation and every foreign appropriation we do, we have probably been the leader in HIV-AIDS and other issues and making sure that children have the nutrients they have, along with NGOs, and a lot of that is American money as well that is given outside the government.

But I guess we could always do more. And I think that is a choice that we can always make and what is available.

But I want to go back to what our view is, some of our views are.

If we could do something to help ourselves to make our environment cleaner, make the world environment cleaner, and we can do it, I think that is something that we ought to try to do.

Also we find ourselves in this country energy dependent on other countries. You haven't had the effect so much in Europe, but there are people who can turn the spigot and turn off energy, or raise the price and cause the loss of jobs and people having huge heating bills and things like that.

So I think one of our goals is energy independence. And I think we get down to the point of what can we do. I think in this country we can do several things. We can do alternative fuels. We have the ability now to look at ethanol and soy diesel and bring other types of fuels into play and, eventually, hydrogen if we do the research.

We also have the ability to look at what we have; 80 percent of the energy that we have in this country happens to be coal. How do you unlock coal? How do you do the research to make sure you can use that energy? Because that is what we happen to have. And I think we need to do that research. We need to find the way. And I am not sure that we have that research yet. I am not sure that we found that way.

But we need to do the engineering, research, and the science to do it. And I think the key is doing it in a clean way.

So our ancestors have been doing it the dirty way for a long time; just dig it out of the ground and put it in a furnace and heat up steel or heat up water in boilers or whatever.

We have to do this in a clean way.

I remember in 1992 I sat on this dais and one of our goals was to find what is the future energy source for this country. And we all agreed it was going to be natural gas. So in the last 15 years every energy unit that has been built in this country—well, small energy unit that has been built in this country, happened to be gas peaker plants. Well today, all of a sudden, we see the possibility of shortage of natural gas. We don't have enough natural gas. So that wasn't a good choice.

But we invested a lot of money and then we will have to be able to make sure that our source of gas, natural gas, keeps flowing.

Unfortunately, we don't want to have to get liquid natural gas from someplace offshore, because that spigot could be shut off as well.

So we have a dilemma in front of us. First of all, how much good can we do? Then what are our resources and how do we bring those together? And I say probably, I am speaking probably out of my own knowledge here, but we probably do more good around the world economically in dollars than any other Nation. We could probably do more. But we do it because of our free market enterprise system and the ability to make money and pay taxes and have the government be able to do that and the private sector doing it too; individuals.

Do you think that course of trying to develop our own resources in a cleaner, better way is reasonable?

Mr. LOMBORG. The very short version is yes. It would be very obvious to say if you were going to increase your research and development you would probably do a lot on clean coal, you would do a lot on carbon capture, and that also seems like one of the very promising technologies. It is still in the high end, again, if the damage cost is $2 per ton of carbon dioxide; the cheapest carbon capture I have heard about is about $20. So it is a still a factor 10 off. That doesn't mean it has to be that way in 20 years.

But the point is, don't try to do it now simply because it makes you feel good that you somehow have done something about the problem, if it means that you are just spending a lot of money but not actually using very much for research and development.

A lot of people will argue that if you put up restrictions, it will increase research and development as a byproduct. Now, theoretical arguments actually indicate that is, at least in the sign, true. But it turns out that that is actually not what happens.

If we look at the the international data on research and development, both in renewables and on conservation, where we can look at them from the international energy agencies, they have been going down and down and down despite Kyoto. So the whole point—and if you look at all the countries that have accepted Kyoto. The point is that when you put up very strict limits, people focus more on how can they just duck under these limits than thinking about how can they solve these problems in 10, 20, 30 years down the line.

And so I would like to just leave you with two things. I don't talk about energy independence because that is not an economic discussion. I fully agree that that is part of the argument that you could go for, saying we want to have less dependence on fossil fuels, and that is a valid argument. That is not one that I look at.

The other one——

Mr. INSLEE [presiding]. Could you wrap up your point Dr. Lomborg?

Mr. HASTERT. I thank the chairman for reminding him. Go ahead, you have another point to make.

Mr. LOMBORG. The last one is simply you mention that you are a very rich country, and if you do can do something you possibly should do it. And again that is, of course, the moral point; yes, in principle, we should solve all problems. The great thing about this Nation is that you can virtually do anything you want, only you can't do all of it at once, so there still is a discussion of saying, well, which of the many great things do you want to focus your attention on?

Mr. INSLEE. Thank you, Doctor

Mr. HASTERT. Dr. Lomborg, thank you very much. We appreciate you being here and your testimony. I yield back my time.

Mr. INSLEE. I yield 5 minutes to Mr. Inglis of South Carolina.

Mr. INGLIS. Thank you for being here, Dr. Lomborg. I am interested in one of your charts. I don't know if we can somehow get it up on the monitor there, but it is the one about cost/benefit analysis.

It is an interesting trajectory.

Mr. LOMBORG. The one with the 1990 stabilizations?

Mr. INGLIS. There it is, up on the board there. I suppose what we are seeing on that chart is something typical of a capital investment, right? And that is, the early years of any capital investment involve more costs than benefit, I think. Isn't that right? If I buy a new air-conditioner, for example, for my house, with a higher efficiency, and replace the one I have got, it is going to take me a number of years to recoup the investment.

So I wonder how standard those lines are in terms of an average capital investment? Particularly the trajectory of the benefit line going off the chart there intrigues me. In other words, is it continuing on headed up in that fashion? If so, then it depends on the time frame as to whether or not that was actually a very good investment. If I was an investor I might buy that product.

Mr. LOMBORG. I would love to sell that to you, then.

Mr. INGLIS. I don't know how specific you can be with that chart. But it just seems to me a fairly standard discussion that you have about any capital investment, isn't it?

Mr. LOMBORG. Yes. The difference is that your air-conditioner will probably pay itself back, if you like air conditioning, within 2 or 3 or 4 years and not 2, 3 or 400 years. And that is the big difference.

The real discussion here is if you couldn't do it better later on, then maybe you should do it right now, yes. But the point is we expect that all of the costs in complying—for instance, we know, for instance, renewables have been coming down in price about 50 percent per decade. So if we could postpone investing in renewables and make up for it by investing more in them, we at least know there is a backstop technology that would make it much much cheaper to do it in 10, 20, 30 years.

Mr. INGLIS. That is an interesting point. The question is, at what point can you get the market going such that entrepreneurs and inventors drive the market? Because there is a market for it. The early technology is always going to look antiquated. If it is a fast-moving market or fast-moving innovation, it is going to be antiquated very quickly.

But the question, of course, for a great country is how do you start moving so that you actually get out of the laboratory and toward the market?

My goal as a conservative is to have the market drive a lot of this. Isn't that the idea? We can't really wait forever for the best technology to come along, because then you don't have market forces at work, right?

Mr. LOMBORG. Yes, you are absolutely right. It is a little bit like waiting for a computer. At some point you actually have to buy it and you can't just say it is going to get better next year.

But on the other hand, you can't buy too early. Denmark was a leader in wind technology, for instance. And we put up way too many windmills way too soon, because we thought it was a cool thing to do.

The problem is now we actually have to take all of them down because we have much better technology that actually allows us to put up new windmills that are much more efficient.

And an argument could certainly be made that we should probably invest it in those windmills 10 years later and that overall, the Danish Economic Council showed that overall, that was a bad investment for Denmark. Now it is probably a good investment.

And as the chairman also pointed out, there are many good things to be done and we should certainly do those. But we should actually ask ourselves if some of these things are great investments. Do that. That is fine.

But some of these we shouldn't do right now.

Mr. INGLIS. Let me ask you this. You think that Mr. Gore is basically taking the worst-case scenario in all of these cases. I wonder if the line there, the benefit line changes if you assume that those aren't the worst-case projections; in other words, that you really do have a situation, let's say, that you get an exponential increase in the problem is your projection.

This chart is too general, I am sure, to answer this question with a chart, but it seems to me that it is perhaps possible that the benefits would change if you assumed that actually those weren't the worst-case scenarios, they were more likely scenarios.

Mr. LOMBORG. Yes. Actually, this particular model does allow for that. It takes into account there is a probability that something very bad will happen, and typically you will be willing to pay an insurance price for that. But the point is that it doesn't, what is the word, it doesn't change it dramatically. It changes it a little bit. And so I am not advocating you should do nothing. I am, for instance, saying you shall put $2 carbon tax. You should also invest in research and development. If you have more probability of very bad things happening, you should perhaps set the recovery tax at $3 and invest $30 billion on research and development. Yes. I also say that in my papers. Sorry.

Mr. INSLEE. We now have Mr. Bartlett for 5 minutes.

Mr. BARTLETT. Thank you very much. I am sorry I couldn't be here for all of your testimony. I would like to refer to your ranking chart that you have where you show from 4 down to 16. Is this a ranking of problems, or is this a ranking of the bang for the buck in solving problems?

Mr. LOMBORG. It is a ranking of solutions, a bang for the buck.

Mr. BARTLETT. Is energy anywhere on the list?

Mr. LOMBORG. No.

Mr. BARTLETT. That is just stunning because I think this energy, which is why you are putting up all of those wind machines, thank you, energy is probably the biggest challenge facing—we may bumble through the global warming thing. If I was in Siberia, you might have a hard time convincing me a little global warming might be bad, but we are not going to just bumble through a peapod. I mean, the energy crisis is real. If it is not here now, it is going to be here very quickly. So I am just stunned that that is not on your list.

When my wife goes to the grocery store shopping, one of the things that will be on her list is thyroid because she needs thyroid medicine. Now if she has only a short-term view, nothing is going to happen if she doesn't take thyroid today or tomorrow or even the day after tomorrow. But if she doesn't take it for the long term, it is going to be absolutely disastrous.

How far down the road, where you are looking when you put together that chart or the folks who put it together, how far down the road were they looking?

Mr. LOMBORG. It depends because we are comparing very many different models. But, for instance, with global warming, it was 300 years. Some of these models, when you look at HIV/AIDS, they don't nearly stretch that far. They should, but they don't.

Mr. BARTLETT. If any of this didn't make your list, how come you put up all of those wind machines?

Mr. LOMBORG. It is a good question. We actually did spend a fair amount of time thinking about which problems should get in there. And what we believe is that, for instance, for energy, the private markets do actually provide many of the solutions. If you look at the whole discussion about peak oil——

Mr. BARTLETT. You read the HSC report? The big HSC report? They believe unless you anticipate peak oil by 20 years, you cannot avoid economic consequences. If you anticipate it only by 10 years, there will be meaningful economic consequences. And if you do not anticipate it at all, which is where we are very near peak oil, then there will be very meaningful, meaningful economic consequences. I am a strong conservative. And I know most of my friends worship the market. They believe it is both omniscient and omnipotent. But there are even some things God can't do. God can't make a square circle, and there are some things the market can't do. You can't pump oil that is not there and you can't build a wind machine at only a certain rate, and you can't exploit the oil shales of our west at only a certain rate. There is only a ramp up time that you need for those things.

For those who you looking for market persons to solve the energy problem. I think they are going to be bitterly disappointed. That is what the Hirsch report said. You don't agree?

Mr. LOMBORG. I don't think I want to get into that discussion, particularly because I don't know that report. I will just leave you, though, with the point that the Stern report, the one that Al Gore was also mentioning, points out that from the economists' points of view, there is definitely enough oil, at least for the next 50 years. Also on increasing demand.

Mr. BARTLETT. I would discourage you of illusion. That just flat out isn't true. There is almost nobody. No authority in the world who believes that comes anywhere close to being true. Is there information out about that that that is the case? Yes. Will it be in the quantities we want to use or the prices we are paying now? Not on your life. It is just not going to be here. It is $60 a barrel now. That may come down momentarily. It won't come down for long. It keeps going up and the oil keeps getting smaller and demand is higher. It isn't true that we don't have to worry about it for 50 years.

If you haven't heard the HSC Report, HSC is a big international corporation that paid for our energy department. There is also a report by the core of engineers paid for by our military. We are now having a third report prepared by the, what is it, the National Council of Oil Council, whatever it is that is doing this for our Energy Department. Because they were concerned that the two reports they got indicated that we had an imminent crisis, and they needed to respond.

Thank you very much. I yield back.

Mr. INSLEE. We will hear from Mr. Shimkus for 5 minutes.

Mr. SHIMKUS. Thank you, Mr. Lomborg. It is great to have you here. I am curious on the political spectrum, just personally, not to go into specifics, I am assuming you would define yourself as center left; is that true?

Mr. LOMBORG. Yes.

Mr. SHIMKUS. Just so the Democrats understand that just because you are our witness, you probably don't ascribe with a lot of the conservative Republican ideology, but you are an economist and that is what separates you and brings you some credibility to this debate. I would much rather trust an economist to understand

what the sign is on this, whether it is a cost or a benefit than a politician or a lawyer. I appreciate your testimony.

You did say something in response to one of the questions, and I just want to highlight before Roscoe leaves, there will be other research in capital investments, into other technologies like coal to liquid, Roscoe, that will help fulfill our need for fuel in the future, and that is the importance of that debate.

Having said that, you did talk about research and development. You made a very good point, because my friends on the other side say put restrictions up and we are going to have research and development. You said, in answer to a question, history does not prove that. And can you restate it briefly how you responded to that?

Mr. LOMBORG. Yes. I would actually like to expand it. Yes, for instance, Kyoto, we do not see increases in research and development being allocated because people think about how can we just slip under instead of worrying about how can we develop technologies 30, 50 years down the line. The second part is also that doing something about climate change means getting very new technologies that have huge public benefits. But it is very hard for private companies to capture them typically because what you develop will not actually go to market in a marketable form but will feed into the next process, into the next development, into the next invection, which will eventually lead to something marketable.

So what you can show is typically these research and development projects perhaps have a return from 30 to 50 percent, but companies can typically only perhaps allocate 20 percent. And so that is why you need public investment. That is actually one of very good places to advocate public investment.

Mr. SHIMKUS. In the Vice President's book, he talks about this, "What are you going to tell your kids in 2023," 17 years from now based upon when the book was printed, what are you going to tell them? That you failed in the moral leadership? I have kids. It is a very real question. If the sign is a negative cost to the governments of the world and the economy and we slide into a recession, there is another question. They are going to ask you did you jump for the political expediency in the scientific demagoguery that the world was coming to an end throwing us into a recession and now we have no jobs. Where were you, dad? Did you stand up against the demagogs, or did you say slow down, let us see if this is real science. What is the cost benefit analysis.

I want to read a section that kind of proves this. Imagine that there is a new scientific theory that warns of an impending crisis and points to a way out. This theory quickly draws support from leading scientists, politicians and celebrities around the world. Research is funded by distinguished philanthropists and carried out in prestigious universities. This crisis is reported frequently in the media, the scientists taught in college and high school classes. I don't mean global warming. I am talking about another theory which rose the promise a century ago. I don't know if you know what this is. Teddy Roosevelt, Woodrow Wilson, Winston Churchill, Oliver Wendell Holmes, Alexander Graham Bell, and it was the scientists' theory of eugenics, which was proven obviously a terrible, terrible process. And if we are not careful, global warming will be

the next eugenic failure and a scourge on mankind if we don't look at the—where is the sign going to be and how do we appropriately address that?

I would recommend also, folks, to go to *www.Lomborg.com*. I did see your 18-minute presentation that you did at Monterey, California. You didn't have much time. 18 minutes. You got it all in. And I encourage my colleagues to go to that presentation. Thank you for spending your time with us.

Mr. INSLEE. Thank you.

Mr. LOMBORG. Can I briefly comment?

Mr. INSLEE. No, because there was no question there. If there had been a question, that would have been great.

Was there a question? Did I miss it? If you would like to ask a question.

Mr. SHIMKUS. No. That is fine.

Mr. INSLEE. I think we are going to have a lot of time for you to get to the meat of this.

We move to Mr. Akin from Missouri for 5 minutes.

Mr. AKIN. We are delighted to have you here, and I was going to get into something that is a little bit more in the weeds, but let me first of all say that we appreciate your standing up, and I guess apparently some people didn't like to hear what you were saying, and yet you are taking legitimate data and just saying hey, think about this. So we appreciate that.

My office has been communicating with a Dr. Jeffrey Hull. He is an associate director at Lowell Observatory in Flagstaff, Arizona. And they are looking into the ongoing research on solar influences on Earth climate. Dr. Hull has been gracious enough to provide us actually reports from our office, and he notes an important component of the discussion about the existence, severity, causes, and consequences of global warming is the role played by the sun in recent and historical climate change.

One of the interesting things in his summary was that astronomers have been observing solar cycles since the mid 1600's. This gives us about 400 years of solar observation.

From this record, I am told that we can see an 11-year cycle of sunspot activity that affects the sun's luminosity, in a sense how powerfully the sun is radiating. And some scientists also believe there seems to be a general increase in solar activity since 1715, and that, in essence, there is a general increase in luminosity of our sun. It appears that this increased solar activity is—that is sun spots—is generally associated with greater luminosity of our sun, that a minimum of sun spots is associated with less radiation coming from the sun.

I was also interested to learn that from 1645 to 1750 there was a period when there were virtually no sun spots observed in so-called mold or minimum. There is a chart we distributed, and I think is now on the overheads through direct space base measurements of the sun. We didn't start beginning to do that until the 1980's. There is speculation that the severity of the years of the mold or minimum was associated with less solar energy reaching the Earth in that cold time period.

Is it tempting to speculate that a general 400-year warming trend to be linked to a general increase in solar activity and that

type of question is being addressed by current researchers. And let me be clear that Dr. Hull is not saying that all of global warming is caused by solar variance. That it is a part of the complex phenomena.

Now here is my question. I heard some experts are speculating that it is possible that the sun could be heading into another long-term absence of solar activity. If so, we may be heading into a long-term cooling period. Do you have an opinion on the potential of a general cooling because of a possible downturn in solar activity, and what do you believe is the role of solar variance on global climate overall.

Also I might throw in as well that we have observed, as I understand it, the melting of poles on Mars which again would not be from CO^2. So if you could respond to those questions, please.

Mr. LOMBORG. Yes. Again it is important to say I am not a scientist. I just read basically the same thing I am sure that you do and many others, and so I would say yes, it is very interesting. It is certainly something we should be aware of. I also know there is a tendency as there is in any scientific endeavor of some models being more popular than others. And so it is harder for some of the solar hypotheses to get through. With that said, I would still say if we are going to make good public policy, we need to base it on the best available research we know today. Now we might be surprised in 20 years and know something else. But right now, the best scientific knowledge we have, I would say, comes from the year end climate panels so it tells us yes, the Earth is warming. A large part of that is due to mankind. Of course, realizing we are going to be spending enormous amount of money on this issue. But we don't have the luxury in any situation in history to act in full and certain information. So we just simply have got to say well, until 2007, that was as good as we could do it.

Mr. AKIN. Thank you very much. I read about half of your book. I appreciate you being very careful in saying this is what we do know, and this is speculative. There is a difference, isn't there.

Mr. LOMBORG. Yes.

Mr. INSLEE. Thank you. Mr. Akin yields back. Mr. Shadegg for 5 minutes.

Mr. SHADEGG. Professor Lomborg, I want to thank you for being here. I want to compliment you on the courage to stand up and speak your own view when it sometimes runs against the common threads of others in the field, and to incur their criticism. I must express for the record how sad I am that the other side of the dais is completely empty. Not a single member from the majority has decided to stay for your testimony.

I suggest that they fear what you might say or at least that they are not open minded to hearing it. This morning, when Vice President Gore testified, the room was full on both sides of the aisle. The minority showed in full number, the majority showed and now for some reason they are afraid to hear your testimony or don't want to keep their minds open to it. I don't suggest that suggests a very balanced discussion of this issue here in the Congress.

I want to go over some of the points in your charts to try to reemphasize your point.

You say global climate change is real. You agree with that?

Mr. LOMBORG. Yes.

Mr. SHADEGG. And you believe it is, at least, in part, human caused?

Mr. LOMBORG. Yes.

Mr. SHADEGG. On the chart, it is about a third of the way in, you talk about it, and you say that on the issue of climate change being real, you say that by 2100, the likely rise in temperature is only 2.6 degrees Celsius. Do you believe that is going to be catastrophic for the world or wipe out humanity?

Mr. LOMBORG. No, of course not.

Mr. SHADEGG. You point out on that same page that .5 percent, the cost would be $15 trillion, and that would amount to less than one half of one percent of the 21st century $3,000 trillion economy GDP; is that correct?

Mr. LOMBORG. Yes.

Mr. SHADEGG. So that is a relatively minor issue in the grand scheme of things; is that correct.

Mr. LOMBORG. Yes.

Mr. SHADEGG. I want to make sure that gets across. So the point would be the severity of this is overstated, is that correct?

Mr. LOMBORG. There is definitely a tendency to one side, yes. I would also add, if you look at the U.N. climate panel scenarios, this comes from the U.N. climate panels scenarios of $3,000 trillion estimate. If you chose another route, which was not so economically focused and not so globally focused which you could argue is the kind of approach that is suggested by Gore and others, the U.N. estimate is that we would end up with about $550 trillion less over the century. So you could very easily end up by trying to solve a trillion dollar deficit, that is a bad idea.

Mr. SHADEGG. I appreciate that point. Further on the sea level rise, you point out that it is expected to be, according to the IPCC, believe, 1 foot over the next 100 years, and yet you are aware that in his movie, Mr. Gore presents it as a rise of 20 feet.

Mr. LOMBORG. Yes.

Mr. SHADEGG. And that is one of the exaggerations that you are critical.

Mr. LOMBORG. That is absolutely unsupportable. Imagine if I went out and made the opposite exaggeration. If I said instead of 1-foot, it would only be half an inch over the next hundreds of years. That is just as much exaggeration to the other side. I would imagine a lot of people would come out and rightly so, criticizing me.

Mr. SHADEGG. And they would lynch you. And they would criticize you severely. I found it fascinating that you also pointed out that over the last 150 years, it has already been about 1 foot. I take it that is also based on IPCC or impurity of science.

Mr. LOMBORG. The IPCC only talks about 100 years, but this is the best knowledge we have over the last 150 years.

Mr. SHADEGG. On the next page of your PowerPoint, and I would urge people to go look at it, you point out that with regard to Greenland, Mr. Gore is predicting a 20-foot increase in sea level and IPCC is predicting a 1.4 inch increase; is that correct?

Mr. LOMBORG. Yes.

Mr. SHADEGG. That is another example of the kind of exaggeration in this debate?

Mr. LOMBORG. Yes. It is unlikely to make good judgements.

Mr. SHADEGG. Are you familiar with an article which appeared in the New York Times, kind of a right-wing journal entitled "From a Rapt Audience, a Call to Cool the Hype" by William Broad that talks about these exaggerations?

Mr. LOMBORG. I saw that, yes.

Mr. SHADEGG. And in it, it points out that many scientists are concerned about Mr. Gore's point being exaggerated and erroneous.

Mr. LOMBORG. It is true that there is a lot of scientists that will back Al Gore, but I think it is also because they are saying, well it is possible. Well everything is possible, but we need to get a sense of how probable it is and yes, there are a number of scientists——

Mr. SHADEGG. I would encourage people to look at that article. I want to conclude by asking you, could you give us an estimate of how realistic two goals that Mr. Gore cited for us today are? One, how realistic is it to immediately freeze all CO^2 emissions, and two, how realistic or economically reasonable is it to reach a 90 percent reduction by 2050?

Mr. LOMBORG. You could reasonably freeze CO^2 emissions. It would be costly but not overly so. It would also have absolutely no effect on the climate, certainly no measurable effect for the next 50 years, probably 100 years. Reduction by 90 percent by 2050. I just thought I had never heard him say that before, and I think it is ludicrous. It is really not something that is going to happen. The British have been toying about, and have now decided on 60 percent by 2050 and most people seem to think that that is on the verge of not being possible. It is certainly going to be very, very costly, and we know the estimates of trying to do 90 percent cut from the cost benefit models and that indicates that the cost is in excess of $85 trillion, and you have got to ask yourself whether that is the right way to tell your grandchildren yes, we cared so we spent that much money.

Mr. INSLEE. The gentleman's time has expired.

Five minutes from Mr. Sullivan from Oklahoma.

Mr. SULLIVAN. Thank you, Mr. Chairman, and thank you for being here today. And I was reading some of the information that we had here, and you were actually a member of Greenpeace at one time?

Mr. LOMBORG. Yes.

Mr. SULLIVAN. And you were considered one of those environmentalist extremists at one time?

Mr. LOMBORG. I wasn't out on a rubber boat or anything but yes.

Mr. SULLIVAN. You obviously aren't doing that anymore. What made you change your mind? What did you see when you were active in Greenpeace that maybe turned you away from being a member anymore?

Mr. LOMBORG. Unfortunately, it is a much more mundane story. I was a student. I ran out of money. I think it is important to say if it wasn't going to be a provocation, I would still be a member of Greenpeace. I think Greenpeace does an important piece of work. They point out that there are problems and issues that we should

be concerned about. But of course we shouldn't trust them exclusively. And I think the problem that I have with many green organizations is that they so very one-sidedly come out and just tell us one side of that story.

And that is unlikely to make good judgements, and that is why I think it is important that we hear sort of the full story both on the disadvantages. Yes, 2,000 people are going to die from heat deaths, but also the advantages, 20,000 are not going to die from cold deaths and get a sense of the proportion of the costs.

Mr. SULLIVAN. Some of these groups, like Greenpeace and others, do present themselves one-sidedly, like maybe Vice President Al Gore. Wouldn't you agree?

Mr. LOMBORG. Yes. Absolutely.

Mr. SULLIVAN. Out of Al Gore's testimony, you are here today, and you are doing a great job, and it is not as crowded as it was with Al Gore, the media is not clicking the cameras like they were when he was in here. Do you see that when you go around? Why is it? What is so captivating to the American people? What do you think it is that is getting this attention?

Mr. LOMBORG. It is important to say that is not something I have any expertise in. I would imagine politicians would know that much better. But I will offer this slight thought that I think there is something very soothing about having just one thing that we need to worry about. And climate change does give that sort of purpose a little bit like the Cold War was oddly comforting because at least we knew there was just one thing we were up against and that was the one coordinating view point of the world.

Maybe it is that, I don't know. But it is certainly incorrect in the sense of saying yes, climate change is a problem. It is not going to be the end of the world as we said before. And we need to realize there are many other problems that our kids are also going to ask us why didn't we do something about those.

Mr. SULLIVAN. What would you say was the most erroneous thing Al Gore says when he gives his PowerPoint presentation?

Mr. LOMBORG. Well, two things. First of all, the 7 meters of sea level rise, 20 feet sea level rise is simply unbelievable that he can get away with saying these kinds of things. He is saying it correctly in the sense he simply says if Greenland melted, or if Antarctica melted, but you come up with a lot of ifs that are not very relevant for public policy. It is probably the most played clip from his movie, and of course, it looks very, very dangerous, when you look at it. Of course, had he actually shown a foot and the same levels, you wouldn't have been able to see it on his graphs. I can see why he chose to do so, but it doesn't make better information.

The other thing he said here today is that it is actually going to be costless. That we are actually going to make money off of it. I think we have to be honest and say things that we don't already do and things that are worth while having, cost money and there is nothing strange about that. The whole discussion is to say how much money are we willing to pay for it. At least, let us be honest that it will cost money. How much money are we going to be willing to pay for it. How much good are we going to get out of it and unfortunately, all peer reviewed research shows that it is not actually worth going down the road that Al Gore is suggesting?

Mr. SULLIVAN. It kind of reminds me, Doctor, remember the Y2K, everyone thought that was going to be the end of the world too, and I remember I got up the next day and everyone thought things seemed to be going fine. I think there were some things that needed to be fixed with computers and changing dates and whatever they need to do, but maybe they did simply overreact in the financial industry and other things and spent money.

On the 20-foot sea level. Now you say sea levels or the consensus of scientists is it would rise 23 inches in the next 100 years is that correct? He says 20 feet. What do you think?

Mr. LOMBORG. Yes. About a foot. It is from 18-centimeters to——

Mr. SULLIVAN. OK. In the previous 100 years prior to that, how much did the seas rise?

Mr. LOMBORG. They rose about 20 centimeters.

Mr. SULLIVAN. Did that have a detrimental effect to the globe.

Mr. LOMBORG. It probably had some cost, yes. Every change has a cost, but it was a very, very slight one. And we also know pretty much that it is going to be a future slight one.

Mr. SULLIVAN. Do you think in the next 10 years, we won't know the planet as we do today? It will be a disaster, as Al Gore says.

Mr. LOMBORG. No. Of course not. It won't.

Mr. INSLEE. We have two more upcoming votes. So we would like to hear from Mr. Burgess of Texas for 5 minutes.

Mr. BURGESS. Thank you for your patience today. I almost feel like I should apologize for some of the questions you were asked earlier when you opened your session. Let me ask you about the Copenhagen Consensus, the program that you worked on. The participants in that process and the reception you received from them, when you began that project, do you think they had a concept of going into that project that climate change was going to be so low on the scale of incidents that you had listed there? Do you think they were surprised about the results.

Mr. LOMBORG. That is hard to know actually. I don't know. I mean, obviously, all of these people who are Noble laureates are pretty knowledgeable people. I am sure they have given some thought to these issues. On the other hand, I don't think that they have ever systematicized them in the way that we ask them to do. They were probably somewhat surprised. I would imagine you can't be entirely surprised about your own actions, even if you get more knowledge.

Mr. BURGESS. But did they suggest from their comments after the ranking was ascertained and then made public, were there any comments from the participants that gee, I thought Mr. Bartlett, I thought energy would have been on there somewhere.

Mr. LOMBORG. They made those choices and they didn't suggest anything. I think, moreover, if you ask people to prioritize, it is a very strange experience, because you come in and think all you oh, I can easily do that, but suddenly you realize, which I am sure you have to do every year when you do the budget, you basically realize I can't actually do everything, and I have to say if I want more of this, I will have to have less of that.

Mr. BURGESS. No, it never stops us.

Mr. LOMBORG. I know a slight problem with that. But still, but the issue, of course, was that actually does affect you, and that was

the main thing that a lot of these people came away with that it does sharpen your mind in saying what do you want to do first.

Mr. BURGESS. It seems like part of your argument is one of the smartest ways to address this problem is to have people invest in their own health and welfare. Do you think that is a fair statement?

Mr. LOMBORG. It is certainly important if we care about people who get malaria, we have got to ask isn't there much better ways. If we care about people who get hurt by hurricanes, isn't there much better ways to deal with that than investing in global warming and the answer is yes.

Mr. BURGESS. And Kyoto takes a different approach to that?

Mr. LOMBORG. Kyoto is not a very efficient way of dealing with any problem, not even malaria or hurricanes, and not even global warming.

Mr. BURGESS. What about the European Union approach?

Mr. LOMBORG. Not very economic either.

Mr. BURGESS. Vice President Gore ran through about seven things. He went through them fairly quickly. We didn't have that in his prepared testimony, but I would just like to go through those quickly with you and get an idea of those which you think are reasonable suggestions and those which you think are less reasonable.

The first one, I guess, we have already answered with the European Union approach accelerating Kyoto from 2012 to 2010. I am going to assume you would not put that high on a list if you were prioritizing.

Mr. LOMBORG. I think it is unrealistic.

Mr. BURGESS. What about the concerns of methane from the tundra and landfills?

Mr. LOMBORG. It is important to say that dealing with land cover methane is probably a good suggestion. It is probably one of the cost efficient ways of dealing with it. So I think the Vice President is absolutely right there.

Mr. BURGESS. What about, he talks about a moratorium on coal plants an absolute moratorium on coal plants, unless we deal with carbon dioxide or carbon capture from those coal plants.

Mr. LOMBORG. I think there is a general problem in trying to say we want to regulate individual areas. You want to put a general carbon tax. That was actually Mr. Gore's second proposal, and I fully agree with that. Of course, that should be a scientifically-based carbon tax and that should be a $2 carbon tax, but then you should leave it up to the market to decide where should you basically take it into account that extra malady. You shouldn't ban building of coal-fired power plants. You should make sure they pay the right price.

Mr. BURGESS. We heard testimony in this committee, I think, it was yesterday that in order to capture 60 percent of the carbon from coal-fired power plants, it would retire duplicating the existing natural gas pipeline in just this country in order to sequester carbon. The electronet which we talked about, we actually have that in Texas. I am going to assume that is a reasonable suggestion.

Mr. LOMBORG. Probably yes.

Mr. BURGESS. One of the things he talked about that actually sounded intriguing, in the very little bit of time I have left, was the concept that you build environmentally in a more sensible fashion, more energy-efficient fashion, since a lot of these things are going to cost more at the outset of building a house or business that you be able to amortize those over the life of the loan or the life of the business. Does that seem like a reasonable suggestion.

Mr. LOMBORG. It is possible that it could be a good suggestion. You should also be very aware that many of these estimates have turned out to be wildly exaggerated in the sense—there is an enormous technology optimism in many of these kinds of projects. I don't know if you remember the similar technology optimism against nuclear power in the 1950's. We have a tendency to expect that this is going to be very cheap. It is going to pay itself back very quickly, and the reason why people don't do it is typically because they know there are more problems than what is being taken into account.

Mr. INSLEE. Thank you, Doctor. We will now allow 5 minutes from Mrs. Bono of California.

Mrs. BONO. Thank you, Professor, for your testimony and for staying with us this long and sitting through Al Gore's testimony as well.

I have probably a bigger fear than most people do here in this room. Certainly, I also, like my colleague Congressman Shadegg, wish Democrats were here to hear what you have to say, because I am actually undecided on this issue, and am trying to find a way to move forward into the future. I am completely open-minded. I appreciated Vice President Gore's testimony as well as yours. But in California, we have experienced energy crises. I live in the Palm Springs area. It is beautiful 9 months out of the year, but 3 months are quite hot. We have worked in Congress to enact public policies that expand the LAHI Program, which is public assistance, generally speaking, for the cold areas to pay for heating costs. We have moved that into the desert Southwest region for people to pay for high cost cooling costs.

But I am concerned that we in this town will enact policies too quickly that may cause deaths. And I know you said that by 2008, that we might have 2,000 more heat-related deaths because of global warming, but I am concerned that immediately, because if it is flawed public policy, it will create more deaths in hot climates, because of people not being able to afford their cooling.

There is some thinking, and actually, Senator Boxer is a constituent of mine. We share a region. She moved to my area. I love working with her on most issues but on this one, I am concerned. Today, I read in a local paper, Roll Call, where she says, and I quote, "If the President chooses to veto a bill, that sets it up as a huge issue in the presidential election, Boxer said." She goes on to say. "So we will do our best to get as many bills on his desk as we can that deals with greenhouse gas reduction. I think it is key that we do that, because I do want to set it up for the presidential campaign, which is another one of my goals."

So as a resident of southern California when I see people die every year because they can't afford their cooling costs, this sort of thinking scares me and I would appreciate your bringing some

common sense and trying to slow the pendulum down from going the other way.

My question is simple, and perhaps I am setting myself up for a loss. But is it possible that we can enact and pass some of these policies that will actually increase costs in the immediate sense that right away, these cooling costs will get to be too high for my constituents, and I will see more people die. It is a very simple question, but I am afraid of that.

Mr. LOMBORG. I am absolutely sure you can make bad deals, make bad policies. I am sure everyone here recognizes the possibility of making bad political deals. So you have to be careful. That doesn't mean we shouldn't enact any policies, but it means we need to carefully weigh cost and benefits on both sides. I don't know anything about this particular area of Palm Springs.

Mrs. BONO. It was 1:30 Saturday. So it was a record for us.

Mr. LOMBORG. Yes. And absolutely we will see more of these records, because global warming is right as we believe it is. We will see increasing temperatures. But we have got to remember that there will also be fewer cold deaths. And the whole point here is to say there is something curious—in Britain, we have these numbers how people talk incessantly about the 2,000 Brits who died in the 2003 European heat wave, but don't talk about the 25 to 50,000 Britons who die every year from cold. And we need to have that conversation. It is not the same thing as saying that the outcome is obvious but it is to say we shouldn't just go down one road. We shouldn't just be concerned about one issue.

Mrs. BONO. The question I have, the public policy, California passed a very flawed bill that created the energy crisis that we lived through, and we are continuing to see the effects from. So really, for me as a policymaker, to be completely open minded, and I appreciate your being here, as my colleagues have pointed out, you are not a traditional witness for us, but I appreciate you brought to the dialog a different point of view.

And that is my concern, that this shouldn't be set up by election timetables. It really ought to be set on public policy that really affects people's lives.

Mr. LOMBORG. Absolutely. As one of the economists point out, which I think is very, very true, that global warming is a 100-year problem. And there is something wrong in believing that it is something that we can fix within 10 or 15 years. It is going to require long-term work between—what they say it is a problem that will need work between continents, between generations and between political parties. And you can only do that by not trying to force the issue and try to say we need to now. That is going to turn out actually to be counterproductive, because people are going to fall apart. That was essentially what we saw with the Kyoto protocol. We need to make sure that we do smart moves that are going to lead us down the right path but recognizing there are many other problems.

Mrs. BONO. Thank you.

Mr. INSLEE. Thank you. We will have a vote fairly shortly. It would be the Chair's intention to continue until we run up against the vote when we gavel that. So I will yield myself 5 minutes.

Dr. Lomborg, this is really interesting to me for a lot of different reasons. One of them is you are the sort of designated hitters for the Republicans. We have a baseball game every year, and you are the designated hitter for the Republican Party. And you have come across the pond and one of the things you said, I think if I understand this correctly, that you believe it is an appropriate policy to adopt a carbon tax on energy sources that use carbon. And I think I heard you, something in the neighborhood of $2 a liter, or gallon.

Mr. LOMBORG. Oh, no. $2 per ton of carbon dioxide.

Mr. INSLEE. I am glad you clarified that. But the point is, it is stunning to me if the Republicans essentially brought you here to diminish this problem and to diminish the necessity of having a policy to deal with it, the only person they could get in the world came here to tell us that we ought to have a carbon tax.

Now, I tell you why that is stunning. It does not exactly fit in the Republican sort of approach to these issues. And what it tells me, what it tells me is that at least one economist in the world, and that is you, believes this problem is bad enough, that it deserves a tax on carbon which is a fairly significant event. That is what it tells me. And I want to ask you why, and with this question: I know President Note of the Marshall Islands. He is the president of the Marshall Islands. It a very low atoll in the South Pacific. He is contemplating a day when he will have to move his entire nation and abandon his entire nation because of this 1 foot rise, which is anticipated on a more likely-than-not basis in the next century.

Now, maybe to some of us, that is not a big deal. But to him, it is a really, really big deal that he has to move his entire nation. And is now already trying to barricade the Pacific, and we haven't talked about the acidification of the ocean today, which is killing the corals, which according to the science, we won't have any coral reefs that are healthy which protects his island nation.

I also know a guy named, a Mayor Tocktoo, who is the mayor of Shishmaref. It is an American city. It is on the Arctic Ocean on the northern coast of Alaska. Shishmaref, Alaska is going to be the first city in Alaska that has to be abandoned because of global warming. Now, maybe that 1-foot rise doesn't mean much to many of us here, but I can tell you to Mayor Tocktoo, who has lived there with his people for 4,000 years, and because of this issue, we are going to have abandon the first American city, not hypothetically. But they got plans to do it and they know where they are going, 13 miles to Tin Creek, Alaska. They are going to have to pick up and move.

Now what I sense you are telling us, in sum, after listening to you here for quite a while, is that this problem is big enough, bad enough, and serious enough that we ought to have a tax on carbon. And I am not saying I agree with that, but I want to know what your position is on that regard?

Mr. LOMBORG. Thank you very much. There were a couple of questions in there. I am not here because I am going to support one side or the other. I think I was also asked earlier on. I probably consider myself slightly left-wing in a Danish perspective, which probably makes me a socialist, or worse, here.

But the whole point is, as the Vice President also pointed out, if there is a negative impact from carbon dioxide, any economist will tell you you should tax that. You should essentially make sure that you tax the externality.

What I am saying though, and I hope I am also getting that message through, is that the only scientifically justifiable amount is somewhere between $2 and $15. So that is much lower tax than what most people are suggesting.

Mr. INSLEE. Could you give a brief answer?

Mr. LOMBORG. Alaska, Marshall Islands, I think it is important to say as we also realize in the last 150 years, it is very rare that we actually give up lands. We actually do defend it and it turns out to be very, very cost efficient.

Mr. INSLEE. With all due respect, the president of the Marshall Islands doesn't have anywhere to defend. It is all going to be underwater.

You have continually questioned the former Vice President of the United States, suggesting that he essentially was saying something inaccurate about Greenland melting, and I believe you have continually misstated what he has told the public. And I want to read to you what it says on page 196 of his book of "An Inconvenient Truth". It says "If Greenland melted or broke up and flipped into the sea, or if half of Greenland and half of Antarctica melted or broke up or slipped into the sea, sea levels worldwide would increase by between 18 and 20 feet."

Do you agree with that statement?

Mr. LOMBORG. Yes.

Mr. INSLEE. And the reason you agreed to it is because it is true, and that is what former Vice President Gore has told people. And I frankly, am a little bit taken aback that you would try to misstate his statement because he has told repeatedly that we are looking at 1 foot rises during the next century in a more probable-than-not basis. There are phenomena that could rapidly, rapidly cause melts that we don't understand.

And in the last 4 weeks, scientists in my home town have found melting of the Arctic way, way, way beyond anything anybody predicted. And in the last 2 months, and my time has expired. I will allow you to comment, if you would like, to comment on that.

Mr. LOMBORG. Three things. You do say that the Marshall Islands have no way of solving this. I do know of the only peer reviewed study we have of all of the land area and actually shows that we will lose very, very little land area. Because people can actually take action. I don't know about the Marshall Islands. I am sorry. I didn't bring that study, but I do know for instance, about the Shasalsa, the Maldives, the Tulavu, all of the other islands that we worry about, and they are not going to lose significant amounts of land areas simply because we are rich enough and they will be rich enough to deal with that and that is very likely the case with Alaska.

When you talk about my misrepresenting the Vice President, I would like to refer you back to the statements earlier. I did actually say that was exactly what the Vice President said. However, it doesn't take a Ph.D. to point out that when you put that image into the public area, which the Vice President has done very clearly

with the movie, it is being projected as something that could happen. He also talks about, and I quote from the book, how it could lead to an evacuation of the Beijing area. That is not something that happens over 100, 200 years. That is something that would happen very rapidly.

Mr. INSLEE. Excuse me. I am sorry to put further comments into the record, but I have gone way over my time, and I am going to now yield to Mr. Barton for 5 minutes.

Mr. BARTON. Thank you, Mr. Chairman. Did you ask a full 5-minute second round or just one question? I just want to know.

Mr. INSLEE. Our intention is go as far as we can until the next vote.

Mr. BARTON. I wanted to know what the constraint was.

Dr. Lomborg, I want to read the same quote that Chairman Inslee just read. If Greenland melted or broke up and slipped into the sea, or if half of Greenland and half of Antarctica melted and slipped into the sea, sea levels worldwide would increase by 18 to 20 feet. You said that would agree with that.

My question to you is what is the probability, in your mind, or in the consensus in the scientific community today, of Greenland melting and breaking up, or half of Greenland and half of Antarctica melting and breaking up? What is the probability of that?

Mr. LOMBORG. I don't think we can answer that very well, but it is clearly not very big and it was not one that was considered reasonably——

Mr. BARTON. Is it 1 in 100, 1 in a 1,000?

Mr. LOMBORG. Probably lower than 1 in 100 and of course, that is why I would like to take issue with the statement of saying I am misrepresenting the Vice President. It is clearly the most viewed clip from his whole movie. It scares people and it scares people because it makes them think this might actually happen. Now it is true that everything might actually happen. Everything has a non-zero probability.

Mr. BARTON. Well, if Texas fell into the sea, the sea level would probably lower by 2 or 3 feet, because Texas is very big. So I mean I could point out that, too.

Mr. LOMBORG. If we are going to have serious and reasonable conversation on this issue, you have to present the facts in the best possible way that we can. And Mr. Vice President Al Gore certainly didn't do that when he chose to only focus on the 18 to 20 and not——

Mr. BARTON. Isn't it true that the IPCC, not Vice President Gore, but the IPCC says based on the best scientific evidence that they have today, sea levels are going to go up about 23 inches in the next 100 years?

Mr. LOMBORG. Twenty-three inches must be the top level, yes, of 59 centimeters yes.

Mr. BARTON. If you have answered this question, you don't have to answer it again. The Vice President seemed to indicate in his testimony, that if we just do some of these mandatory things on carbon in the U.S., the Chinese would be morally obligated to follow us. In your interaction with the international community, do you see any evidence that the Chinese will follow us out of some sense of moral obligation given the fact they are building one coal-

fired plant a week and as far as I know, they don't seem to be using the best control technology and they are not building many nuclear plants?

Do you share the Vice President's view that the Chinese are on the verge of becoming born again true believers in doing the right thing environmentally, even if it costs them four or five times when it would cost them to build the kind of plants they are building right now?

Mr. LOMBORG. No. But I actually thought Al Gore was pretty moderate in that particular estimate. He told us what they say is something very different from what they do. And he said it has been more likely that the U.S. enacted greenhouse gas curbs that it probably still is fairly——

Mr. BARTON. It is my view of the Chinese and given what they have done on intellectual property, what they have done with their military technology, in fact what they have done in every area is that they do the least absolute possible and still be involved in international commerce. That they have almost no sense. I won't say they have none. But they have minimal sense of any kind of a western civilization type moral obligation.

And when Chairman Dingell and I were at Kyoto back in the early 1990's, he asked the Chinese when they would see fit to engage in some sort of Kyoto type protocol. They said they wouldn't do it in 10 years. They wouldn't do it in 100 years, and they finally admitted to Chairman Dingell, they probably wouldn't do it in 1,000 years.

Now that was their position in the early 1990's. It is possible that they have changed, but I think it is unlikely. And with that, we thank you for your testimony and I yield back.

Mr. INSLEE. Thank you, Dr. Lomborg. We are going to have one more question area, and we are going to have a vote. So we are going to have to excuse ourselves. So if you can keep your answers relatively succinct, so we can make sure Mr. Shimkus gets through.

Mr. SHIMKUS. Thank you. Dr. Lomborg, what is the cost of fear and how does it affect the economic analysis that you try to do?

Mr. LOMBORG. We certainly know from the biggest study of the cost of saving human lives in the U.S. through different policy areas and they only looked at policies that were designed to save human lives, both in traffic, health, safety.

Mr. SHIMKUS. But what about——

Mr. LOMBORG. No. I am sorry. I have a very specific answer to that question. The cost there turned out to be that you avoid, or you forego saving about 60,000 Americans each year because you overworry about some very highly publicized but fairly low incident fears and forget some of the very many and much more amenable fears.

Mr. SHIMKUS. So there is a great cost of fear?

I bring this up because I want to read a quote from a Dr. Stephen Schneider, who is quoted in Discover Magazine in October of 1989. He says this, and I will just read the small part,

To do that we need to get some broad-based support to capture the public's imagination. That, of course, entails getting loads of media coverage. So we have to offer you up scary scenarios to make simplified dramatic statements and make little mention of any doubts that we might have. This double ethical bind we frequently find

ourselves and cannot be solved by any formula. Each of us has to decide what the right balance is between being effective and being honest.

I hope that means being both. And this is in response to scientists who have data—facts are tough things. They have data. They know the questions but for the sake of pushing a cause, like the whole Greenland quotes, what the Vice President has done and I think in conjunction with your testimony, is he is doing this double bind ethical—this is not a cost benefit analysis approach. This is the ends justify the means. Let us scare the world, let us say there is going to be 20 feet sea rises and let us bend the economic assumptions, which you have tried to analyze, really get distorted. Is that so?

Mr. LOMBORG. Yes. Very much so.

Mr. SHIMKUS. So you have been attacked by the scientific community because my analysis is you are trying to expose and just say come on scientists, let us just use the facts. And that helps the decisionmakers apportion our public policy on a cost benefit analysis approach.

Mr. LOMBORG. Yes. I might also just add that Dr. Schneider who made that quote, I am sure he has regretted that quote many times. He was actually one of the esteemed people that wrote criticism of me in Scientific American which I find a little amusing and slightly ironic.

Mr. SHIMKUS. So the guy who attacked you for being disingenuous is a guy who admitted to falsifying or distorting for political purposes——

Mr. LOMBORG. Or at least not being alien to that concept.

Mr. SHIMKUS. I appreciate your time here and your patience with us. And I can yield back. I yield my time to the Speaker.

Mr. INSLEE. The Speaker for the remaining time.

Mr. HASTERT. I have a letter here from President Klaus that I would like to submit. I think you have seen it.

Mr. INSLEE. Without objection. So ordered.

Mr. HASTERT. I also want to thank our witness today who came a long way. You have taken a few bumps. You have performed very well. I am sure that we don't really see eye to eye on everything that you have to talk about, but I think you have brought a new perspective and made us look at this issue much deeper, and I appreciate, Dr. Lomborg, your being here and your participation.

Mr. INSLEE. Dr. Lomborg, if you run into Svin Aukin in Copenhagen, say hello for me and tell him we are going to do some wind turbine construction and cogeneration and green building here in this country, and we are going to do some great things with those.

Mr. LOMBORG. He is going to be absolutely thrilled.

Mr. INSLEE. We are adjourned.

[Whereupon, at 5:00 p.m., the hearing was adjourned.]

[Material submitted for inclusion in the record follows:]

June 5, 2007

THE HONORABLE AL GORE, JR.
Nashville, TN 37203

DEAR MR. VICE PRESIDENT:

Thank you for appearing before the Subcommittee on Energy and Air Quality on Wednesday, March 21, 2007, at the joint hearing with the Committee on Science and Technology entitled "Perspectives on Climate Change." We appreciate the time and effort you gave as a witness before the subcommittee.

Under the Rules of the Committee on Energy and Commerce, the hearing record remains open to permit Members to submit additional questions to the witnesses. Attached are questions directed to you from certain members of the committee. In preparing your answers to these questions, please address your response to the Member who has submitted the questions and include the text of the Member's question along with your response.

To facilitate the printing of the hearing record, your responses to these questions should be received no later than the close of business on June 19, 2007. Your written responses should be delivered to 2125 Rayburn House Office Building, Washington, DC, 20515, and faxed to (202) 225–2899 to the attention of Rachel Bleshman. An electronic version of your response should also be sent by e-mail to Ms. Bleshman at *rachel.bleshman@mail.house.gov*. Please send your response in a single Word or WordPerfect formatted document.

Thank you for your prompt attention to this request. If you need additional information or have other questions, please contact me or have your staff contact Ms. Bleshman at (202) 225–2927.

Sincerely,

JOHN D. DINGELL
Chairman

Cc: The Honorable Joe Barton, Ranking Member
Committee on Energy and Commerce

The Honorable Rick Boucher, Chairman
Subcommittee on Energy and Air Quality

The Honorable J. Dennis Hastert, Ranking Member
Subcommittee on Energy and Air Quality

The Honorable Bart Gordon, Chairman
Committee on Science and Technology

The Honorable Ralph M. Hall
Subcommittee on Energy and Air Quality

The Honorable Tammy Baldwin
Subcommittee on Energy and Air Quality

QUESTIONS FROM THE HONORABLE RALPH HALL

1. Mr. Gore, in your testimony you stressed that climate change should be an issue where partisan politics are put aside. Unfortunately, the complexity of the issue lends itself to confusion and criticism of those that ask questions in the quest of understanding. For example, Congressman Reichert and I want to learn more and investigate the facts of what has caused global warming and to what level man has contributed prior to determining the best course of action to address the problem. So please assist in resolving areas of conflicting information for me.

Your movie makes a compelling argument for how mankind has contributed to $C0^2$ in the atmosphere. However, some scientists, including those on the Intergovernmental Panel on Climate Change say they have a "low" level of understanding surrounding water vapor in the atmosphere. Scientists say that water vapor makes up 95 percent of the atmosphere and is a major greenhouse gas. The remaining 5 percent of the atmosphere is where scientists have a greater level of understanding.

a. What are your thoughts on this and in your view how much more do we have to learn about the content of the atmosphere and the effect on global warming?

b. Certain scientists argue that throughout history, while there is a correlation between $C0^2$ and warming, it is reversed. $C0^2$ increases after warming, not before. In fact, the strongest causal correlation found has to do with sun spot activity. Can you help me reconcile competing views on this topic?

c. Are you open to having a dialog with those whose scientific conclusions seem to conflict with what you are saying so there is a better understanding of the differences amongst various scientific conclusions?

2. Is it your opinion that in order to stabilize atmospheric $C0^2$ concentrations, other countries will have to reduce their emissions as much as the United States? Do you expect countries like China to reduce their emissions at roughly the same time as the United States? What will happen to the United States companies/industries in the near term that face competition from countries that do not reduce their emissions until much later?

3. In developing a long term, comprehensive climate change strategy for the United States, do you believe adaptation should play a role? If so, what role do you think adaptation should play? How would you measure and compare the costs and benefits of adaptation to the costs and benefits of carbon controls?

QUESTIONS FROM THE HONORABLE TAMMY BALDWIN

1. As an esteemed lawmaker and a leader on environmental matters, it was a pleasure to have your unique perspective as we continue our series of hearings on climate change and move forward with legislation to address the issue.

You have made it your life's mission to raise the profile of global warming—and through your work on the Energy & Commerce Committee, your participation in the Kyoto Protocol, the publication of two books, and the documentary production of "An Inconvenient Truth," you have alerted the world to the dangers of climate change and the opportunities that lie ahead in addressing this global challenge.

I agree that the science is clear—and now it is time for action. This means the creation of sound policy that will result in reduced greenhouse gas emissions, improved energy efficiency, and increased fuel economy standards. These issues must be confronted head on, by taking aggressive steps that put our Nation at the forefront of the world and allow us to be global leaders in the movement for change.

Unfortunately, over recent years, there has been a disconnect. Despite the growing body of knowledge about the rising global climate, it has not been met with the kind of bold action that is needed to meaningfully bring about change.

What do you consider the greatest impediments individuals, businesses, and government face in taking bold action to respond to the challenge of climate change?

2. We all agree that it will be a challenge to enact meaningful legislation that will push the envelope in terms of creating efficient, effective, and environmentally friendly climate change programs. But it can be done. In fact, it must be done.

And our role in addressing this issue matters. People around the world are watching us—looking to us to set an example. As Americans, we have an obligation to ourselves and to the world to take on this task and become teachers and leaders to show the world that we are willing to take bold action to protect humankind and the planet itself.

Last year, I joined many of my colleagues on the Energy & Commerce Committee on a fact-finding tour of some countries that are innovators in clean, efficient, renewable, energy production. We visited countries that have significantly smaller footprints on the world than we have, both in terms of geography and population, yet they are making significant advances that improve the quality of the air they breathe, the food and water they consume, and the lifestyles they pursue.

I was particularly impressed by what I saw in Denmark—the world's leading producer of wind energy, and in Sweden, a country in the process of phasing out its nuclear energy because they have reached a political decision that it is not a sustainable resource.

You, too, have traveled the world and seen the impact of sound energy and environmental policies. How can we match the progress made by these innovative nations and emerge as an international leader?

3. For decades, America's economy has been the world's strongest—and for decades we have maintained that distinction, due to the bold commitment of previous generations of American leaders who made investments in our people and their potential.In my district in south central Wisconsin, the potential for innovation is great. In fact, Wisconsin is emerging as a leader in advancing innovative solutions to address climate change. For instance, the University of Wisconsin-Madison is contributing to an international fusion energy program that will provide a viable energy source with no greenhouse gas emissions. Also, a company in my district, Virent Energy Systems, has been able to turn biomass into gasoline—not ethanol, but gasoline. And, yet another company, Spectrum Brands, is developing a unique, safe, and on-demand hydrogen fuel generator.

Despite the amazing ingenuity, challenges exist in terms of funding and making products commercially viable. What recommendations can you offer to increase America's opportunities for innovation?

4. My home State of Wisconsin has a proud and historic tradition, known as the Wisconsin Idea—the notion that our great research institution, The University of Wisconsin-Madison, serves not just those on campus, but all the people of the state and, in fact, the Nation. (You'll recall that our Nation's Social Security Plan was formulated by some UW Professors).

Today, the University of Wisconsin is fostering innovative research and has, as an institution, taken many steps to reduce its emissions by becoming more energy efficient and investing in clean energy sources.

Our capital city, Madison (and 12 others in our State) have become "Cool Cities" by signing the U.S. Mayors Climate Protection Agreement. These Wisconsin cities are aiming to reduce their global warming emissions by an amount equal to what would be required under the Kyoto Protocol.

What can Congress do to help local governments, universities and other private entities (institutions), in Wisconsin and across the country contribute more to finding solutions that will slow, stop and reverse global climate change?

[*Editor's note:* Responses from Mr. Gore to these additional questions had not been received when this hearing was printed.]

ONE HUNDRED TENTH CONGRESS

U.S. House of Representatives
Committee on Energy and Commerce
Washington, DC 20515–6115

JOHN D. DINGELL, MICHIGAN
CHAIRMAN

March 6, 2007

His Excellency Vaclav Klaus
President of the Czech Republic
11908 Prague 1, The Czech Republic

Dear President Klaus:

The Committee on Energy and Commerce of the U.S. House of Representatives has begun to examine the issue of mankind's contribution to global warming and climate change. The Committee, given its jurisdiction over energy policy and environmental issues, will be the principal advisor to the U.S. House of Representatives on matters concerning legislation to enhance the United States' current efforts to address energy policy and future climate change. Both Republican and Democratic members of the Committee seek to have as full an understanding of the facts as possible before the Committee acts within this complex policy area.

Over the past several decades, as an economist and political leader, you have developed an important perspective on the forces that effect individual freedom and economic progress and abundance, especially as you have helped to lead the Czech Republic out of the deadly stagnation of the former Soviet regime to become one of the fastest growing, vibrant economies in Europe. You have also taken public positions regarding the climate change debate. We believe your perspective on the political, economic, and moral aspects of the climate change debate can be useful as we seek to assess the potential impacts of proposed U.S. climate-related regulations on the economic well-being of its citizens and their ability to contribute to future economic vitality and innovation here and abroad.

We write today to invite your informed personal response on the climate change concerns currently confronting policymakers in Europe and the United States. You should know our Democratic counterparts have invited former Vice President Al Gore – another leading opinion maker – to testify on such matters before our energy subcommittee on March 21, 2007. We would welcome hearing from you in time for this hearing. Additionally, we would welcome hearing from you directly in either a private meeting or a more formal venue if your level of interest and schedule permit.

Although we appreciate whatever perspective you believe can contribute to our deliberations, we would also welcome your responses to the following questions:

1. Concerning mankind's contribution to climate change and in keeping with obligations towards the welfare of our citizens: what, in your view, should policymakers consider when addressing climate change?

2. How should policies address the rate and consequences of climate change and to what extent should regulation of emissions of greenhouse gases be a focus of any such policies?

3. What will be the effect on national economies, consumer well-being, job creation, and future innovation under various climate change policy scenarios that have come to your attention?

4. What impact and effectiveness will so-called cap-and-trade policies have upon the reduction of climate change threats and our ability to address these threats in the future?

5. What is the moral obligation of developed countries to the developing countries of the world? Should developed countries embark on large emissions reduction schemes while developing countries are allowed to continue to increase emissions unabated?

We write in an effort to contribute to the bi-partisan consideration of these matters and very much respect your perspective on these matters. If you have any questions, please contact us or have your staff contact David McCarthy, Chief Counsel for Energy and Air Quality, at (202) 225-3641.

Sincerely,

Joe Barton
Ranking Member
Committee on Energy and Commerce

J. Dennis Hastert
Ranking Member
Subcommittee on Energy
and Air Quality

cc: His Excellency Petr Kolar, Ambassador to the United States
The Honorable John Dingell, Chairman
Committee on Energy and Commerce
The Honorable Rick Boucher, Chairman,
Subcommittee on Energy and Air Quality

Answers to questions from the House of Representatives of the U.S. Congress, Committee on Energy and Commerce, on the issue of mankind's contribution to global warming and climate change

Václav Klaus, President of the Czech Republic

1. Concerning mankind's contribution to climate change and in keeping with obligations towards the welfare of our citizens: what, in your view, should policymakers consider when addressing climate change?

The – so called – climate change and especially man-made climate change has become one of the most dangerous arguments aimed at distorting human efforts and public policies in the whole world.

My ambition is not to bring additional arguments to the scientific climatological debate about this phenomenon. I am convinced, however, that up to now this scientific debate has not been deep and serious enough and has not provided sufficient basis for the policymakers' reaction. What I am really concerned about is the way the environmental topics have been misused by certain political pressure groups to attack fundamental principles underlying free society. It becomes evident that while discussing climate we are not witnessing a clash of views about the environment but a clash of views about human freedom.

As someone who lived under communism for most of my life I feel obliged to say that the biggest threat to freedom, democracy, the market economy and prosperity at the beginning of the 21st century is not communism or its various softer variants. Communism was replaced by the threat of ambitious environmentalism. This ideology preaches earth and nature and under the slogans of their protection – similarly to the old Marxists – wants to replace the free and spontaneous evolution of mankind by a sort of central (now global) planning of the whole world.

The environmentalists consider their ideas and arguments to be an undisputable truth and use sophisticated methods of media manipulation and PR campaigns to exert pressure on policymakers to achieve their goals. Their argumentation is based on the spreading of fear and panic by declaring the future of the world to be under serious threat. In such an atmosphere they continue pushing policymakers to adopt illiberal measures, impose arbitrary limits, regulations, prohibitions, and restrictions on everyday human activities and make people subject to omnipotent bureaucratic decision-making. To use the words of Friedrich Hayek, they try to stop free, spontaneous human action and replace it by their own, very doubtful human design.

The environmentalist paradigm of thinking is absolutely static. They neglect the fact that both nature and human society are in a process of permanent change, that there is and has been no ideal state of the world as regards natural conditions, climate, distribution of species on earth, etc. They neglect the fact that the climate has been changing fundamentally throughout the existence of our planet and that there are proofs of substantial climate fluctuations even in known and documented history. Their reasoning is based on historically short and incomplete observations and data series which cannot justify the catastrophic conclusions they draw. They neglect the complexity of factors that determine the evolution of

the climate and blame contemporary mankind and the whole industrial civilization for being the decisive factors responsible for climate change and other environmental risks.

By concentrating on the human contribution to the climate change the environmentalists ask for immediate political action based on limiting economic growth, consumption, or human behavior they consider hazardous. They do not believe in the future economic expansion of the society, they ignore the technological progress the future generations will enjoy, and they ignore the proven fact that the higher the wealth of society is, the higher is the quality of the environment.

The policymakers are pushed to follow this media-driven hysteria based on speculative and hard evidence lacking theories, and to adopt enormously costly programs which would waste scarce resources in order to stop the probably unstoppable climate changes, caused not by human behavior but by various exogenous and endogenous natural processes (such as fluctuating solar activity).

My answer to your first question, i.e. what should policymakers consider when addressing climate change, is that policymakers should under all circumstances stick to the principles free society is based on, that they should not transfer the right to choose and decide from the people to any advocacy group claiming that it knows better than the rest of the people what is good for them. Policymakers should protect taxpayers' money and avoid wasting it on doubtful projects which cannot bring positive results.

2. How should policies address the rate and consequences of climate change and to what extent should regulation of emissions of greenhouse gases be a focus of any such policies?

Policies should realistically evaluate the potential our civilization has, as compared with the power of natural forces influencing climate. It is an evident waste of society's resources to try to combat an increase of solar activity or the movement of ocean currents. No government action can stop the world and nature from changing. Therefore, I disagree with plans such as the Kyoto Protocol or similar initiatives, which set arbitrary targets requiring enormous costs without realistic prospects for the success of these measures.

If we accept global warming as a real phenomenon, I believe we should address it in an absolutely different way. Instead of hopeless attempts to fight it, we should prepare ourselves for its consequences. If the atmosphere warms up, the effects do not have to be predominantly negative. While some deserts may get larger and some ocean shores flooded, enormous parts of the earth – up until now empty because of their severe, cold climate – may become fertile areas able to accommodate millions of people. It is also important to realize that no planetary change comes overnight.

Therefore, I warn against adopting regulations based on the so- called precautionary principle which the environmentalists use to justify their recommendations, the clear benefit of which they are not able to prove. Responsible politics should take into account the opportunity costs of such proposals and be aware of the fact that the wasteful environmentalist policies are adopted to the detriment of other policies, thus neglecting many other important needs of millions of people all over the world. Each policy measure must be based on a cost- benefit analysis.

Mankind has already accumulated tragic experience with one very proud intellectual stream that claimed that it knew how to manage society better that spontaneous market forces. It was communism and it failed, leaving behind millions of victims. Now, a new -ism has emerged that claims to be able to manage even nature and, through it, people. This excessive human pride – just as the previous attempts – cannot but fail. The world is a complex and complicated system that cannot be organized according to an environmentalist human design, without repeating the tragic experience of wasting resources, suppressing people's freedom, and destroying the prosperity of the whole human society.

My recommendation, therefore, is to pay attention to the thousands of small things that negatively influence the quality of the environment. And to protect and foster fundamental systemic factors without which the economy and society cannot operate efficiently – i.e. to guarantee human freedom and basic economic principles such as the free market, a functioning price system and clearly defined ownership rights. They motivate economic agents to behave rationally. Without them, no policies can protect either the citizens or the environment.

Policymakers should resist environmentalist calls for new policies because there are too many uncertainties in scientific debates on climate change. It is impossible to control natural factors causing climate change. The negative impact of the proposed regulation on economic growth is to the detriment of all other possible risks, including the environmental ones.

3. What will be the effect on national economies, consumer well-being, job creation, and future innovation under various climate change policy scenarios that have come to your attention?

If the policymakers accept the maximalistic environmental demands, the effects on national economies will be devastating. It would stimulate some, very small parts of the economy while leaving a bigger part of it choked by artificial limits, regulations, and restrictions. The rate of growth would decline and the competitiveness of the firms on international markets would be seriously affected. It would have a negative impact on employment and job creation. Only rational policies, making spontaneous adjustments possible, can justify government intervention.

4. What impact and effectiveness will so-called cap-and-trade policies have upon the reduction of climate change threats and our ability to address these threats in the future?

Cap-and-trade policies are a technical tool to achieve pollution reduction goals by more market compatible means. They can help if the general idea behind the scheme is rational. I do not believe the whole idea to combat climate change by emission limits is rational and I, therefore, consider the technicalities of its eventual implementation to be of secondary importance.

5. What is the moral obligation of developed countries to the developing countries of the world? Should developed countries embark on large emissions reduction schemes while developing countries are allowed to continue to increase emissions unabated?

4

The moral obligation of developed countries to the developing countries is to create such an environment which guarantees free exchange of goods, services, and capital flows, enables utilization of comparative advantages of individual countries and thus stimulates economic development of the less developed countries. Artificial administrative barriers, limits and regulations imposed by developed countries discriminate the developing world, affect its economic growth, and prolong poverty and underdevelopment. The environmentalist proposals are an exact example of such illiberal policies that are so harmful for the developing countries. They will not be able to cope with the limits and standards imposed on the world by irrational environmental policies, they will not be able to absorb new technological standards required by the anti-greenhouse religion, their products will have difficult access to the developed markets, and as a result the gap between them and the developed world will widen.

It is an illusion to believe that severe anti-climate change policies could be limited to developed countries only. If the policies of the environmentalists are adopted by developed countries, sooner or later their ambitions to control and manage the whole planet will spread the emissions reduction requirements worldwide. The developing countries will be forced to accept irrational targets and limitations because "earth is first" and their needs are secondary. The environmentalist argumentation gives ammunition to protectionists of all colors who try to eliminate competition coming from newly industrialized countries. Therefore, the moral obligation of the developed countries is not to introduce large emissions reduction schemes.

March 19th, 2007

Ice Core Records of Atmospheric CO_2 Around the Last Three Glacial Terminations

Hubertus Fischer, Martin Wahlen, Jesse Smith, Derek Mastroianni, Bruce Deck

Air trapped in bubbles in polar ice cores constitutes an archive for the reconstruction of the global carbon cycle and the relation between greenhouse gases and climate in the past. High-resolution records from Antarctic ice cores show that carbon dioxide concentrations increased by 80 to 100 parts per million by volume 600 ± 400 years after the warming of the last three deglaciations. Despite strongly decreasing temperatures, high carbon dioxide concentrations can be sustained for thousands of years during glaciations; the rise of this phase lag is probably connected to the duration of the preceding warm period, which controls the change in land ice coverage and the buildup of the terrestrial biosphere.

Previous studies of Antarctic ice cores (*1–3*) revealed that atmospheric CO_2 concentrations changed by 80 to 100 parts per million by volume (ppmv) during the last climatic cycle and showed, together with continuous atmospheric measurements (*4*), that anthropogenic emissions increased CO_2 concentrations from 280 ppmv during preindustrial times to more than 360 ppmv at present, an increase of more than 30% of the glacial-interglacial change. Variations in atmospheric CO_2 concentrations accompanying glacial-interglacial transitions have been attributed to climate-induced changes in the global carbon cycle (*3, 5*), but they also amplify climate variations by the accompanying greenhouse effect. Accordingly, the relation of temperature and greenhouse gases in the past derived from ice core records has been used to estimate the sensitivity of climate to changes in greenhouse gas concentrations (*7*) to constrain the prediction of an anthropogenic global warming. This procedure, however, requires the separation of systematic variations representative for all climatic cycles from those specific for each event, as well as a more detailed knowledge of the leads and lags between greenhouse gas concentrations and climate proxies.

To resolve short-term changes in the atmospheric carbon reservoir, to constrain the onset and end of major variations in CO_2 concentrations, and to test whether these variations are temporally representative, we expanded the Antarctic Vostok CO_2 record over the transition from marine isotope stage (MIS) 8 to MIS 7 [about 210 to 250 thousand years (ky) before present (B.P.)] and analyzed the time interval around the penultimate deglaciation (about 70 to 160 ky B.P.) at a high resolution of 100 to 2000 years (*8*). This data set was supplemented by a CO_2 record recently derived from the Antarctic Taylor Dome (TD) ice core (*6, 9*) covering the last 35,000 years. The internal temporal resolution of ice core air samples is restricted by the age distribution of the bubbles caused by the enclosure process (*10*). This age spread is about 300 years for Vostok (*11*) and 140 years for the TD ice core (*9*) at present but about three times higher for glacial conditions (*11*). The depth–ice age scale used for terminations II and III in the Vostok core is a recently expanded version of the extended glaciological time scale (*12*). The dating uncertainty (on the order of 10,000 years for termination III) is considerable; however, the absolute time scale is not so important as long as we consistently compare Vostok CO_2 with the Vostok isotope temperature (δD) record.

More important is the relative dating of ice and air at a certain depth. The ice age–air age difference (Δage) was calculated with a climatological firn densification model (*11*) and varies between about 2000 and 6000 years for warm and cold periods, respectively. The accuracy of the model is better than 100 years for recent periods but on the order of 1000 years for glacial conditions (*11*), which has to be kept in mind when interpreting the phase shift between ice and gas records of the ice core archive. In the case of termination I, recently published age scales derived by synchronization of CH_4 variations in central Greenland and Antarctic ice cores (*13, 14*) were used. The precision of the CH_4 correlation is about 200 years for periods of substantial CH_4 change but is not very well constrained in the interval between 17 and 25 ky B.P., when only subtle CH_4 changes occurred. The uncertainty of Δage varies between 100 and 300 years for central Greenland (*13*) and between 300 and 600 years for TD (*14*) during termination I. Further uncertainty is added because the TD CO_2 record has been dated relative to the Greenland Ice Sheet Project 2 (GISP2) core (*14*), whereas the Byrd and Vostok isotope temperature records have been synchronized with respect to the Greenland Ice Core Project (GRIP) ice core record (*15*). This uncertainty is not relevant for the interval between 10 and 15 ky B.P., for which dating of GISP2 and GRIP is in good agreement; however, there is a shift of up to 2000 years between the two Greenland reference cores at the age of 20 ky B.P.

In Fig. 1, our data and previously published CO_2 concentration records (*1, 6, 9, 11, 15, 16*) are compared with Antarctic isotope (temperature) ice core records (*15, 17–19*). Note that the CO_2 concentrations represent essentially a global signal. In contrast, the geographical representativeness of isotope temperature records may vary from a synoptical to hemispherical scale and accordingly within different cores with increasing variability for shorter time scales. The Vostok and TD CO_2 data presented here are in good agreement with previous CO_2 values. On a 10,000-year time scale, CO_2 covaries with the isotope temperatures with minimum glacial CO_2 concentrations of 180 to 200 ppmv, glacial-interglacial transitions accompanied by a rapid increase in CO_2 concentrations to a maximum of 270 to 300 ppmv, and a gradual return to low CO_2 values during glaciation. On a shorter time scale, however, a much more complex picture evolves.

The onset of the atmospheric CO_2 increase during termination I recorded in the TD record is at 19 to 20 ky B.P. The rise in the long-term trend in CO_2 concentrations seems to be about 1000 years earlier than the rise in Vostok δD values. In contrast, temperatures apparently started to rise at 20 ky B.P., as recorded in the Antarctic Byrd and the Greenland GRIP ice cores (*13*). Again, CO_2 concentrations in the Byrd record increase ~2000 ± 500 years later than those in the TD data. In view of the excellent agreement for the rest of the CO_2 records, these discrepancies can be attributed to the insufficient age constraint during the onset of termination I induced by the different Greenland reference cores. No such dating uncertainties are encountered for the interval between 10 and 15 ky B.P. Maximum CO_2 concentrations of 270 ppmv are reached at 10.5 ky B.P. (*9*), 600 to 1000 years after the isotope temperature maximum in the Byrd record (*20*). The CO_2 peak is followed by a decrease of 5 to 10 ppmv until 8 ky B.P., after which CO_2 concentrations gradually rise to the preindustrial value of 280 ppmv (*9*). A delay in the increase of CO_2 concentrations with respect to the warming during deglaciation is also indicated by a brief 10-ppmv decline in CO_2 concentrations

Scripps Institution of Oceanography, Geosciences Research Division, University of California San Diego, La Jolla, CA 92093–0220, USA.

found in seven samples during the interval 14 to 13 ky B.P. This distinct feature lags the Antarctic Cold Reversal (ACR) in the Antarctic isotope temperatures (*21*) by 500 to 500 years but occurs 1000 years before the Younger Dryas cooling event.

A dip in CO_2 concentrations at 135 ky B.P. precedes the start of the increase in CO_2 concentrations during termination II, which reaches a maximum of 290 ppmv at 128 ky B.P. Like in the Holocene, CO_2 concentrations decrease after this initial maximum to ~275 ppmv. The onset of the major warming during termination II is hard to define, but during the penultimate warm period, CO_2 concentrations reach their maximum 400 ± 200 years later than Antarctic temperatures. In the following 15,000 years of the Eemian warm period, CO_2 concentrations do not show a substantial change despite distinct cooling over the Antarctic ice sheet. Not until 6000 years after the major cooling in MIS 5.4 does a substantial decline in CO_2 concentration occur. Another 4000 to 6000 years is required to return to an approximate in-phase relation of CO_2 with the temperature variations.

Finally, termination III starts with a CO_2 concentration of 205 ppmv at 244 ky B.P., slightly higher than that for the beginnings of terminations I and II. At that time, temperatures had already increased since the glacial temperature minimum at ~260 ky B.P. CO_2 concentrations rise slowly from 244 to 241 ky B.P. and then rapidly to more than 300 ppmv at 238 ky B.P. Keeping the rather coarse resolution of the ED record before 238 ky B.P. in mind, the major increase in CO_2 tends to lag temperature during the transition, reaching a maximum CO_2 concentration 600 ± 200 years after the peak in δD. In contrast to the case for the Eemian, high CO_2 concentrations are not sustained during MIS 7 but follow the rapid temperature drop into MIS 7.4. Minimum CO_2 concentrations as low as 210 ppmv are reached 1000 to 2000 years after the minima in isotope temperature during MIS 7.4. A short, warm event during the mild glacial interval at 224 to 228 ky B.P. appears to be reflected in a 30-ppmv increase in atmospheric CO_2 concentrations with a phase lag of about 1000 ± 600 years relative to temperature. Another warm event at the beginning of the warm period MIS 7.3 is accompanied by a 30-ppmv increase in CO_2 concentration, which appears to be in phase with the temperature record. The variations in CO_2 concentrations during these events are much larger than anticipated from the Vostok isotope temperature changes and do not have any counterparts during MIS 5.

Comparison of the sequence of events for the three time intervals described above suggests that the carbon cycle–climate relation should be separated into (at least) a deglaciation and a glaciation mode. Atmospheric CO_2 concentrations show a similar increase for all three terminations, connected to a climate-driven net transfer of carbon from the ocean to the atmosphere (*5*). The time lag of the rise in CO_2 concentrations with respect to temperature change is on the order of 400 to 1000 years during all three glacial-interglacial transitions. Considering the uncertainties in Δage (between 100 and 1000 years for recent and glacial conditions),[1] such a lag can still be explained by an overestimation of Δage for glacial conditions. The good agreement of the Δage model with the measured value for the present supports the idea that at least the lag at the beginning of the warm periods is real. The size of this lag is on the order of the ocean mixing time (for a well-ventilated ocean like today), which is the major control for the time constant of equilibration within the deep ocean–atmosphere carbon system after climate-induced changes. In the case of a recent anthropogenic warming, the external climate forcing by CO_2 emissions due to combustion of fossil fuel leads climate variations, so the application of the CO_2–climate relation deduced from the past on a recent global warming seems not to be straightforward.

The situation is even more complicated for the interglacial and glaciation periods. During the extended Holocene and Eemian warm periods, atmospheric CO_2 concentrations drop by ~10 ppmv after an initial maximum, attributable to a substantial increase in the terrestrial biospheric carbon storage extracting CO_2 from the atmosphere. In the case of the Eemian, CO_2 concentrations remain constant after the initial maximum in MIS 5.5 despite slowly decreasing temperatures; during the Holocene, atmospheric CO_2 concentrations even increase during the last 8000 years. Application of a carbon cycle model to CO_2 and $\delta^{13}CO_2$ ice core data for the Holo-

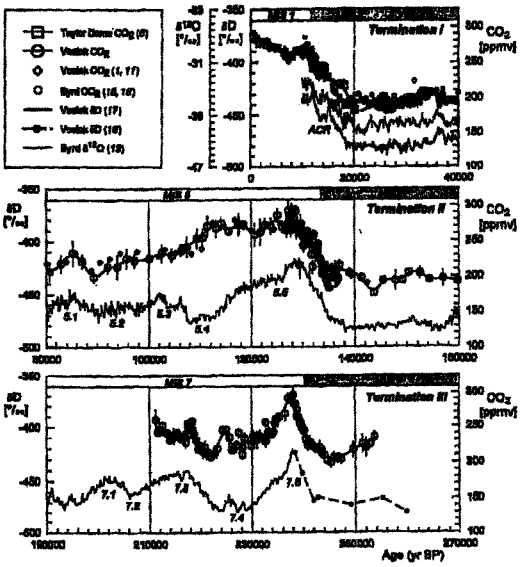


Fig. 1. Records of atmospheric CO_2 concentrations and isotope temperature records derived from the Antarctic Byrd, Vostok, and TD ice cores during the deglaciation and glaciation events around the last three glacial terminations. Error bars in CO_2 concentration data represent 1σ of replicate measurements at the same depth interval. The long-term trend in CO_2 concentrations is indicated by a cubic spline approximation ($r = 5 \times 10^{-5}$) of our data set. For convenience, marine isotope stages (*22*) are indicated as referred to in the text.

cene (9) shows that no equilibrium in the carbon cycle is established and that the waxing and waning of the terrestrial biosphere, possibly related to subtle climate variations and early human land use, are the most important factors controlling atmospheric CO_2 concentrations over the last 10,000 years.

During further glaciation in MIS 5.4, CO_2 concentrations remain constant, although temperatures strongly decline. We suggest that this reflects the combination of the increased oceanic uptake of CO_2 expected for colder climate conditions and CO_2 release caused by the net decline of the terrestrial biosphere during the glaciation and possibly by respiration of organic carbon deposited on increasingly exposed shelf areas. These processes, however, should terminate (with some delay) after the lowest temperatures are reached in MIS 5.4 and ice volume is at its maximum at 111 ky B.P. (22). In agreement with this hypothesis, CO_2 concentrations start to decrease in the Vostok record at about 111 ky B.P. Another possibility to explain this delayed response of CO_2 to the cooling during MIS 5.4 would be an inhibited uptake of CO_2 by the ocean. In any case, about 5°C lower temperatures on the Antarctic ice sheet during MIS 5.4 (17) are difficult to reconcile with the full interglacial CO_2 forcing encountered at the beginning of this cold period and again question the straightforward application of the past CO_2–climate relation to the recent anthropogenic warming.

Another scenario is encountered during MIS 7, in which no prolonged warm period is observed. Although temperatures at the end of termination III are comparable to those at the end of termination II and CO_2 concentrations are even slightly higher, a much shorter lag in the decrease of CO_2 relative to the Antarctic temperature decrease in MIS 7.4 is found. Comparison with the SPECMAP record (23) shows that during the preceding interglacial MIS 7.5, ice volume was much larger than during the Holocene and the Eemian warm periods. Accordingly, the buildup of the terrestrial biosphere during MIS 7.5 is expected to be much less and sea level changes smaller, leading to a smaller net release of CO_2 into the atmosphere during the following glaciation, which is not able to fully counterbalance the CO_2 uptake by the ocean.

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Present-Day Deformation Across the Basin and Range Province, Western United States

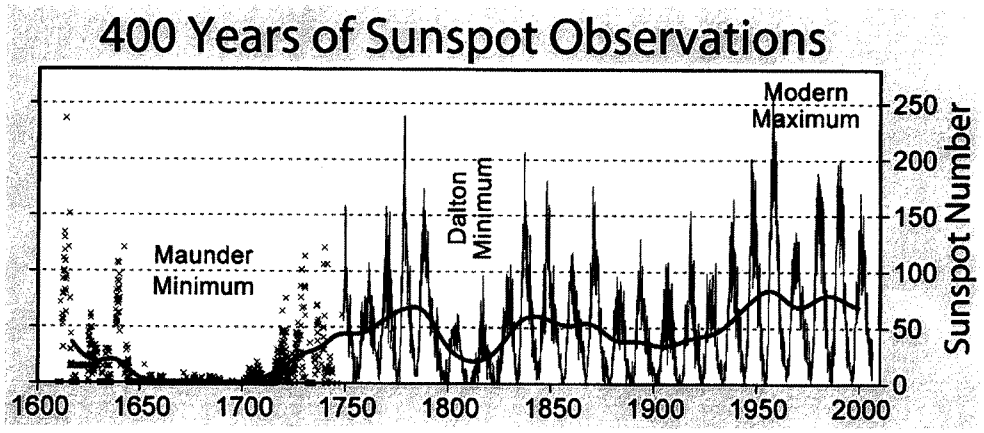
Wayne Thatcher,[1]* G. R. Foulger,[2] B. R. Julian,[1] J. Svarc,[1] E. Quilty,[1] G. W. Bawden[1]

The distribution of deformation within the Basin and Range province was determined from 1992, 1996, and 1998 surveys of a dense, 800-kilometer–aperture, Global Positioning System network. Internal deformation generally follows the pattern of Holocene fault distribution and is concentrated near the western extremity of the province, with lesser amounts focused near the eastern boundary. Little net deformation occurs across the central 800 kilometers of the network in western Utah and eastern Nevada. Concentration of deformation adjacent to the rigid Sierra Nevada block indicates that external plate-driving forces play an important role in driving deformation, modulating the extensional stress field generated by internal buoyancy forces that are due to lateral density gradients and topography near the province boundaries.

The northern Basin and Range province is an actively deforming intracontinental plateau lying between the stable blocks of the Sierra Nevada and the Colorado Plateau (Fig. 1). The province has extended (increased in area) by about a factor of 2 over the past ~20 million years (*1*, *2*), and extension continues with ongoing seismic activity and slip along numerous faults distributed across a zone ~800 km wide (*3*–*5*). Constraints on the internal deformation of the province are limited. Geologic studies delineate regions of Holocene and late Quaternary fault slip (*3*, *4*). Space geodetic measurements broadly define movements across the province (*5*–*8*), and

[1]U.S. Geological Survey, MS/977, Menlo Park, CA 94025, USA. [2]Department of Geological Sciences, University of Durham, Science Laboratories, South Road, Durham DH1 3LE, UK.

*To whom correspondence should be addressed. E-mail: thatcher@usgs.gov


400 Years of Sunspot Observations
Modern Maximum
Dalton Minimum
Maunder Minimum
Sunspot Number
250
200
150
100
50
0
1600
1650
1700
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1800
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2000